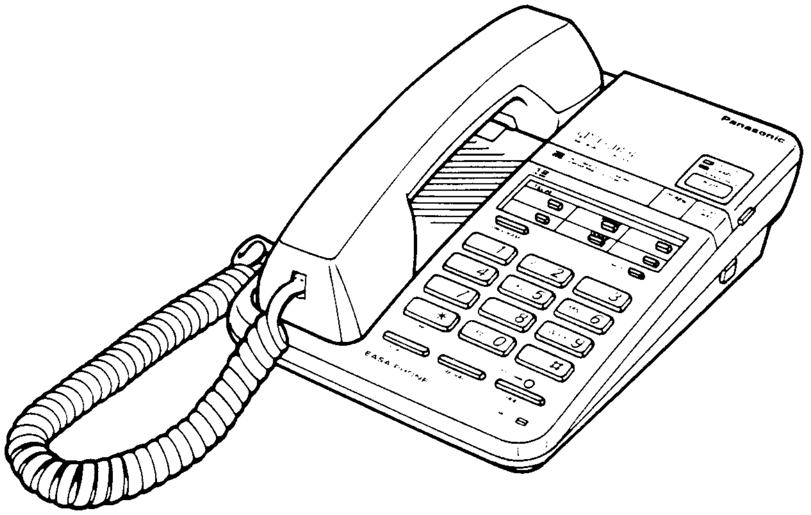
ORDER NO. KM48901820C1
F1

Service Manual
and Technical Guide

Telephone Equipment

KX-T2390

AUTO-LOGIC™
EASA-PHONE®
iTS Integrated
Telephone System



SPECIFICATIONS

General:

Power Source:	AC; AC adaptor KX-A11 (DC 12 V)
Power Output:	350 mW (max.)
Speaker:	Unit; 5 cm ($1\frac{31}{32}$") PM dynamic Handset; 3 cm ($1\frac{3}{16}$") PM magnetic type receiver unit
Microphone:	Condenser microphone
Jacks:	Telephone line, DC IN
Dimensions:	150 (W)×220 (D)×100 (H) mm (with handset) ($5\frac{29}{32}$"×$8\frac{29}{32}$"×$3\frac{15}{16}$")
Weight:	840 g (1 lb $13\frac{1}{2}$ oz) without cassette tapes

Telephone Section:

Memory Capacity:	There are 6 DIRECT CALL buttons, each DIRECT CALL button consists of two functions, they are Upper and Lower memory locations. Each location (Upper and Lower) is capable of storing 16 digits each.
Dial Speed:	Tone (DTMF)/Pulse (10 pps)
Redial:	Last dialed telephone number every time redial button is pressed
Pause:	Time delay (3.5 seconds per pause)

Tape Deck Section:

Outgoing Message (OGM):	Recorded on a micro cassette. Recording Time is up to 30 seconds.
Incoming Message (ICM):	Micro Cassette (MC-30)
Tape Speed:	2.4 cm/s
Wow and Flutter:	0.58% (WRMS)
Motor:	Electrical governor motor

Design and specifications are subject to change without notice.

Panasonic

Matsushita Services Company
50 Meadowland Parkway,
Secaucus, New Jersey 07094

Panasonic Hawaii Inc.
99-859 Iwaiwa Street
P.O. Box 774
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**Matsushita Electric
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5770 Ambler Drive, Mississauga,
Ontario, L4W 2T3

**Panasonic Sales Company,
Division of Matsushita Electric
of Puerto Rico, Inc.**
Ave. 65 De Infanteria, KM 9.7
Victoria Industrial Park
Carolina, Puerto Rico 00630

When you mention the serial number, write down the 11 digits. The serial number may be found on the label affixed to the bottom of the unit.

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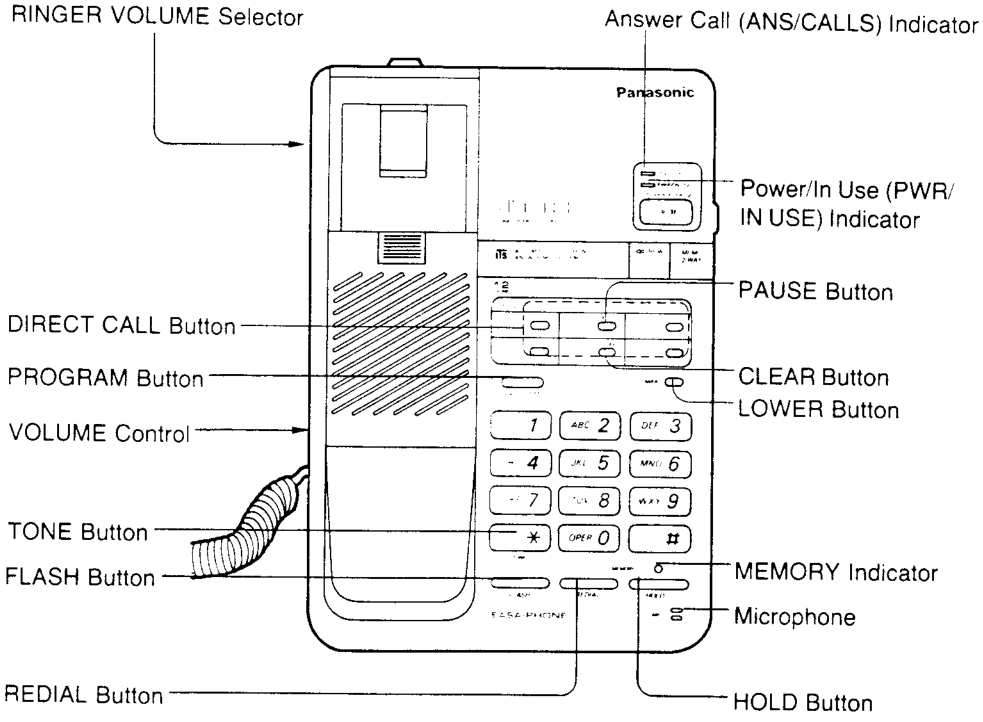
LOCATION OF CONTROLS



RINGER VOLUME Selector
Answer Call (ANS/CALLS) Indicator
Panasonic
Power/In Use (PWR/ IN USE) Indicator
PAUSE Button
DIRECT CALL Button
PROGRAM Button
CLEAR Button
LOWER Button
VOLUME Control
TONE Button
FLASH Button
MEMORY Indicator
Microphone
REDIAL Button
HOLD Button

Fig. 1

DISASSEMBLY INSTRUCTIONS

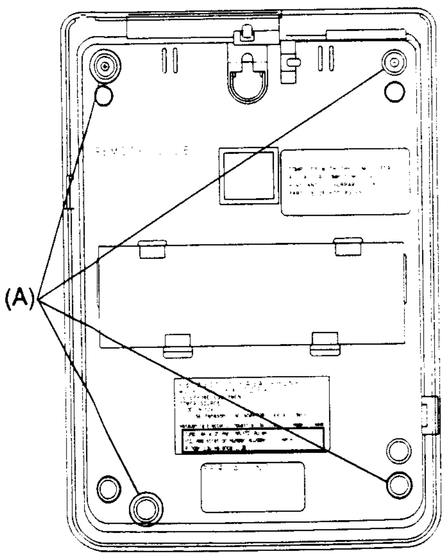


Fig. 2

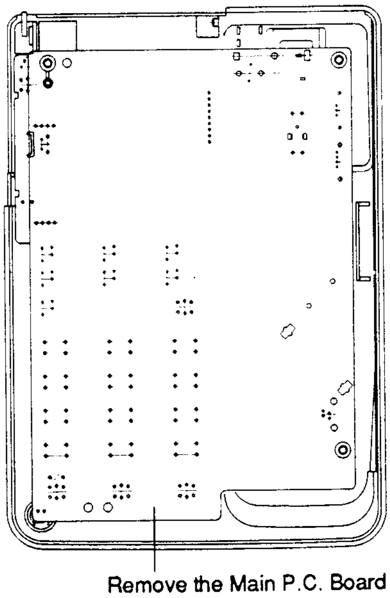

Remove the Main P.C. Board

Fig. 3

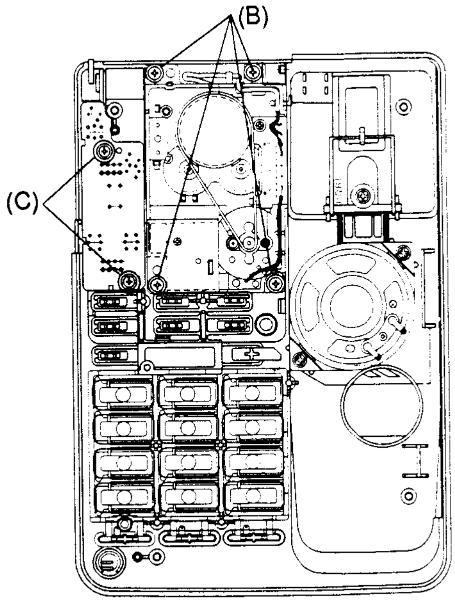


Fig. 4

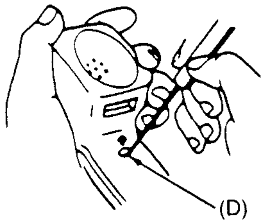


Fig. 5

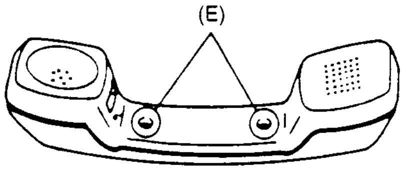
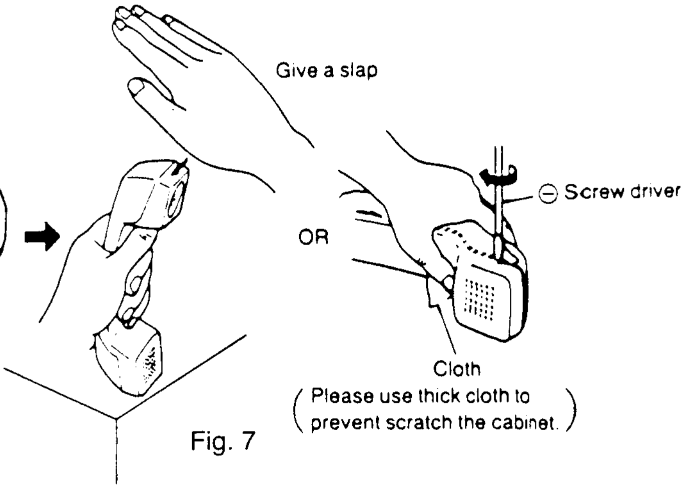


Fig. 6

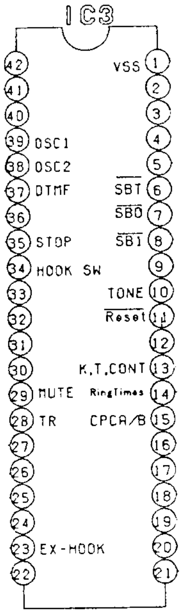

Give a slap
OR
⊖ Screw driver
Cloth

(Please use thick cloth to prevent scratch the cabinet.)

Fig. 7

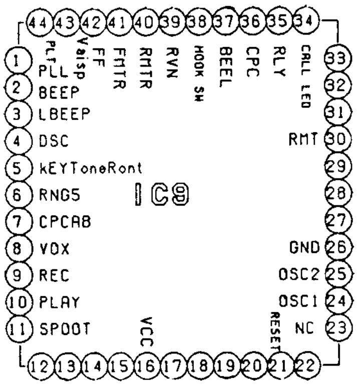
Ref. No.	Procedure	Shown in Fig.—	To remove—	Remove—
1	1	2	Lower Cabinet	**Screws (3 × 14)** .... (A)×4
2	1, 2	3	Main Printed Circuit Board	Remove the Main Printed Circuit Board
3	1~3	4	Cassette Deck	Screws (3×10) .... (B) × 4
4	1, 2, 4	4	Sub Printed Circuit Board	Screws (3×8) .... (C)×2
5	5~7	5	Handset Cabinet	Rubber Caps .... (D)×2
6		6		Screws (3×10) .... (E)×2
7		7		Remove the cabinet

CPU DATA



IC3: MN158413KPB
Program ROM: 4 K
Internal RAM: 3 K bit
Clock Frequency: 3.58 MHz
Power Supply Voltage: 2~5.5 V

Pin No.	Function	High	Low
1	GND Terminal		
2	Key-Scan Output	High-imp	Active
3	Key-Scan Output		
4	Key-Scan Output		
5	Key-Scan Output		
6	Open		
7	Open		
8	(GND Fixed)		
9	Open		
10	Audible Tone/Ringer Output		Usually
11	System Reset Signal Input	Usually	Active
12	Memory/Hold LED Control Output	OFF	ON
13	Audible Tone Control Output	Usually	Active
14	Ring Times Control Output	5 times	AUTO
15	CPC A and B Control Output	B	A
16	Key Input	Disable	Enable
17	Key Input		
18	Key Input		
19	Key Input		
20	Key-Scan Output	High	Active
21	Key-Scan Output		
22	Key-Scan Output		
23	Ex-Hook Signal Input	OFF Hook	ON Hook
24	Option Data and SW Input	Disable	Enable
25	Key Input		
26	Key Input		
27	Key Input		
28	Tip Ring Control Output	ON	OFF
29	Mute Control Output		
30	Open		
31	Open		
32	Key-Scan Output	Disable	Enable
33	Key-Scan Output		
34	Hook Signal Input	ON-HOOK	OFF-HOOK
35	Stop Siganl Input	Standby	Normal
36	Pulse Dial Output		Usaually
37	DTMF Signal Output		
38	System Clock		
39	System Clock		
40	Open		
41	Interrpt Signal Input	Usually	
42	+ Power Source Terminal		


44
43
42
41
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39
38
37
36
35
34
PLT
Vaisp
FF
FMTR
RMTR
RVN
HOOK SW
BEEL
CPC
RLY
CALL LED
1 PLL
2 BEEP
3 LBEEP
4 DSC
5 kEYToneRont
6 RNG5
7 CPCAB
8 VOX
9 REC
10 PLAY
11 SPOOT
IC9
VCC
RESET
33
32
31
RMT 30
29
28
27
GND 26
OSC2 25
OSC1 24
NC 23
12
13
14
15
16
17
18
19
20
21
22

IC9: PQVI4148HA41
Program ROM: 4 K
Internal RAM: 128×4 K bit
Clock Frequency: 4 MHz
Power Supply Voltage: 5.4 V or 5 V

Pin No.	Function	High	Low
1	Plunger (Latch) Control	Active	
2	Beep Output (Monitor)		Normal
3	Beep Output (Line Out)		
4	Auto Disconnect Input	Enable	Diable
5	Audible Tone Control Input	Normal	Active
6	Ring Times Control Input	5 times	Auto
7	CPC A and B Control Input	B	A
8	VOX Input	Disable	Enable
9	Record	Active	
10	Play		
11	Speaker Output Control		
12	Microphone Control		
13	Line-Input Control		
14	Line-Output Control		
15	Speaker Mute Control		
16	+ Power Source Terminal		
17	OGM Switch Input	OFF	ON
18	Playback Switch Input		
19	Memo Switch Input		
20	Rewind Switch Input		
21	System Reset Signal Output	Active	Normal
22	TEST Terminal		
23	None Connect		
24	System Clock Oscillator		
25	System Clock Oscillator		
26	Ground Terminal		
27	ON/OFF Switch Input	OFF	ON
28	Key-Scan Output	Normal	Active
29	Key-Scan Output		
30	Remote Output	Disable	Enable
31	Power/In Use LED Control	ON	OFF
32	OGM LED Control		
33	None Connect		
34	Ans/Calls LED Control	ON	OFF
35	Relay Control		
36	CPC Input	Disable	Enable
37	Bell Input		
38	Hook Switch Input	ON-Hook	OFF- Hook
39	RVN Reed Switch Input		
40	Reverse Rotation (REW) Control	Active	
41	Forward Rotation (PLAY) Control		
42	Forward Rotation (FF) Control		
43	Not Used		
44	Plunger (Trigger) Control	Active	

Circuit Operation:

- Pin 2~5 output the scanning signal to the Dial, FLASH, REDIAL, HOLD switch and the option data.
- Pin 8 inputs the option data.
- Pin 10 outputs the audible tone. The audible tone is outputted from this port as a single tone.
- Pin 11 inputs the reset signal to CPU. When reset, its input is a low level.
- Pin 12 outputs the Memory/ Hold LED indicator. While the LED lights the output is at the low level.
- Pin 13 outputs the speaker mute control signal to the TAM'S CPU. When outputting its output is a low.
- Pin 14 outputs the Ring-Time control signal. (High:5 times Low:AUTO)
- Pin 15 outputs the CPC A-B detect control signal. (High:B Low:A)
- Pin 16~19 are the key data input ports.
- Pin 20~22 output the scanning signal to the LOWER PROGRAM switch and the option switch.
- Pin 23 inputs the hold cancellation detector signal. When the hold switch is cancelled, it inputs a high level.
- Pin 24 is the option data and the Tone/Pulse switch input port.
- Pin 25~27 are the key data input ports.
- Pin 28 outputs the tip ring control signal. When the hold switch is pressed, it outputs a high level.
- Pin 29 is the muting control signal. During muting, its output is a high level.
- Pin 32 and 33 output the scanning signal to station key and the option data.
- Pin 34 inputs the Hook switch signal. When off Hook, it inputs a low level.
- Pin 35 inputs the stop detector signal. (To make the memory backup condition to the CPU.)
- Pin 36 is on output to control the Meke/Break of the Pulse dialing. During break, its output is a low level.
- Pin 37 is the terminal for the DTMF signal output.
- Pin 42 is the + power supply input of the CPU.

IC BLOCK DIAGRAM

IC1 PQVIBA6565A

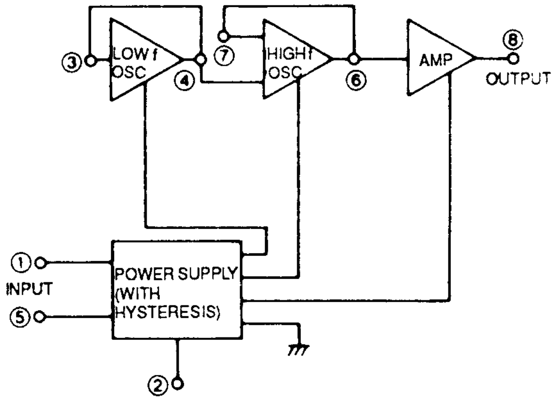


Fig. 7

IC5, 6 PQVIIR3N05

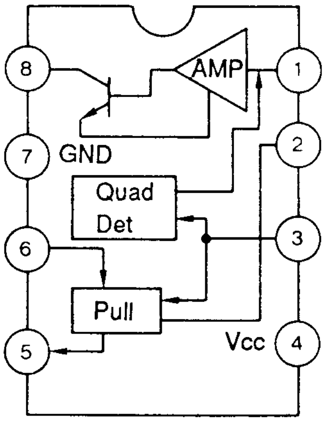
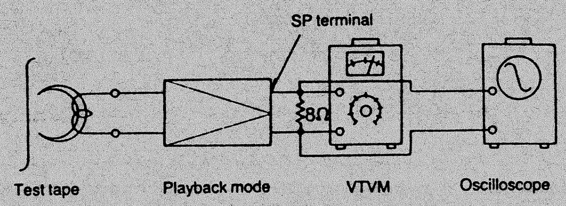
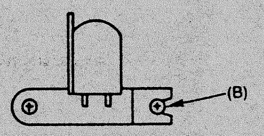
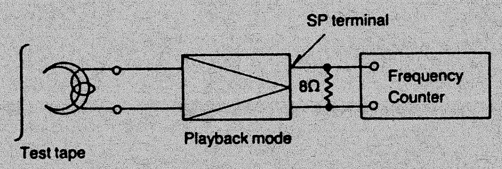


Fig. 8

MEASUREMENT AND ADJUSTMENT METHOD

Notes:
1. Make sure the heads are clean.
2. Make sure the capstan and pressure roller are clean.
3. Room temperature for measuring and adjusting: 20±5°C (68±9°F)
4. Test equipments are not treated as replacement parts.

ITEM	MEASUREMENT & ADJUSTMENT	REMARKS
1. Head azimuth adjustment	1. Play back test tape (QZZMWA). 2. Adjust screw (B) shown in fig. B for maximum output at SP terminal. (Test equipment connection is shown below.)  SP terminal 8Ω Test tape Playback mode VTVM Oscilloscope Fig. A	*Record/playback head  Fig. B
2. Tape speed adjustment	1. Play back test tape (QZZMWA). 2. Adjust R126 for 2990±10 Hz on frequency counter reading.  SP terminal 8Ω Frequency Counter Playback mode Test tape Fig. C	

PLL Adjustment

① fH Adjustment
1. Connect IC6 ③ pin and ⑦ pin, with a capacitor (10 μF).
2. Connect the frequency counter and oscilloscope.
   ⊕ side…IC6 ⑤ pin
   ⊖ side…IC6 ⑦ pin
3. Adjust R59 for fH±7 Hz on the frequency counter reading (Refer to below table).

② fL Adjustment
1. Connect IC5 ③ pin and ⑦ pin, with a capacitor (10 μF).
2. Connect the frequency counter and oscilloscope.
   ⊕ side…IC5 ⑤ pin
   ⊖ side…IC5 ⑦ pin
3. Adjust R57 for fL±7 Hz on the frequency counter reading (Refer to below table).

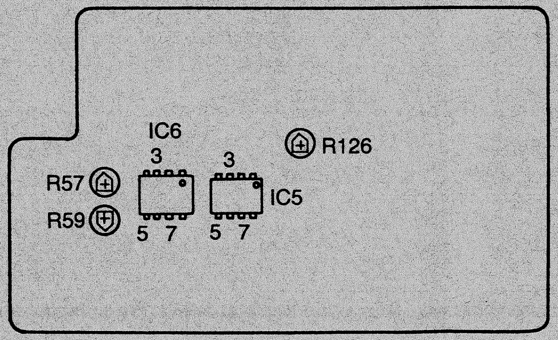

IC6
3
3
R126
R57
R59
5 7
5 7
IC5

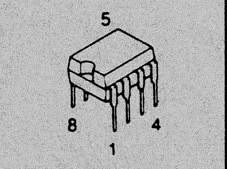
Fig. 9

Label No. (Bottom of the cradle) →

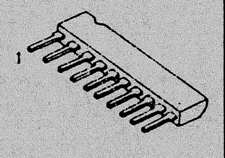
Code	fH (Hz)	fL (Hz)
1	1209	697
2	1336	697
3		
4	1209	770
5	1336	770

Code	fH (Hz)	fL (Hz)
6		
7	1209	852
8	1336	852
9		

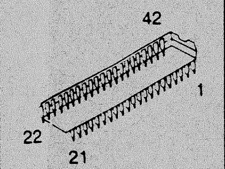
TERMINAL GUIDE OF IC's, TRANSISTORS AND DIODES



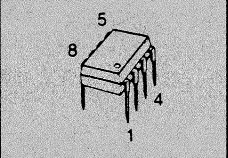
IC1, 10



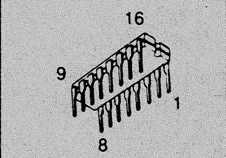
IC2



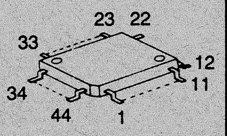
IC3



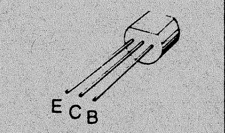
IC4, 5, 6



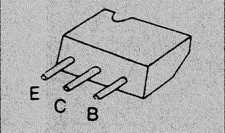
IC7


23 22
33
12
11
34
44
1

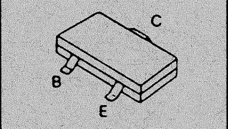
IC9



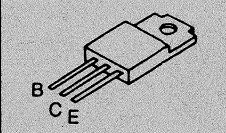
Q1



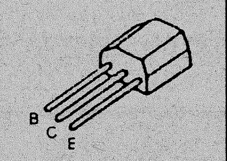
Q2, 7, 9, 18



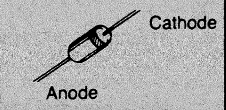
Q3~6, 8, 10~14, 17



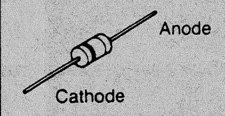
Q15, 16



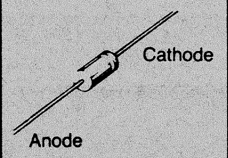
Q19~26


Cathode
Anode

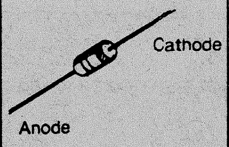
D1~4, 12~17, 19, 22, 23, 25~29, 31~33, 35, 36, 43, 44, 57~59, 70


Anode
Cathode

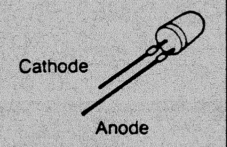
D5, 10, 11


Cathode
Anode

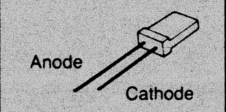
D6~9, 21


Cathode
Anode

D18

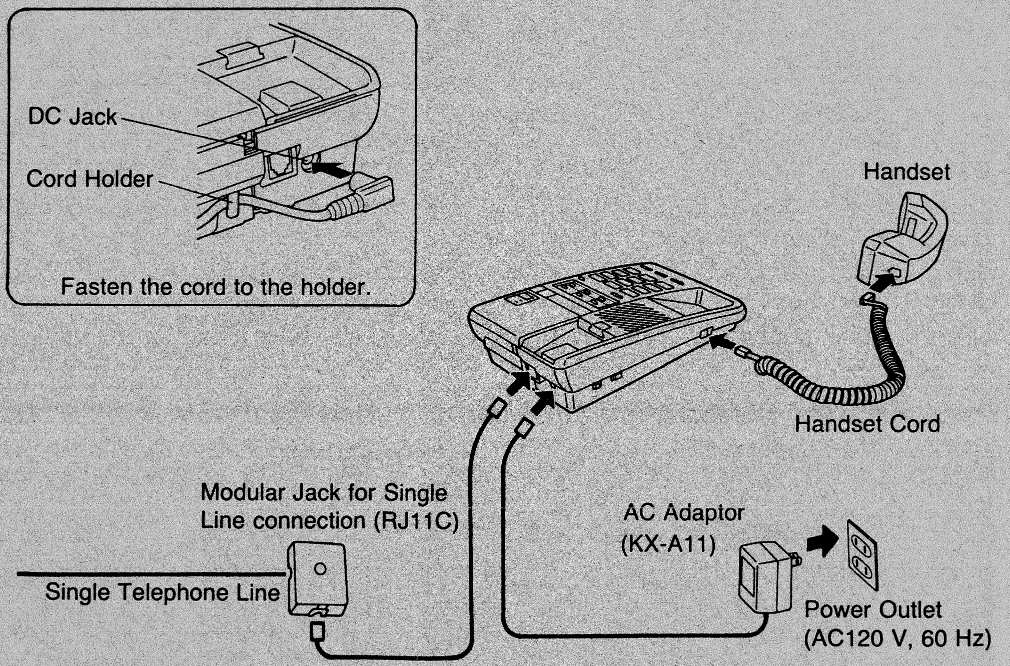

Cathode
Anode

D45, 47

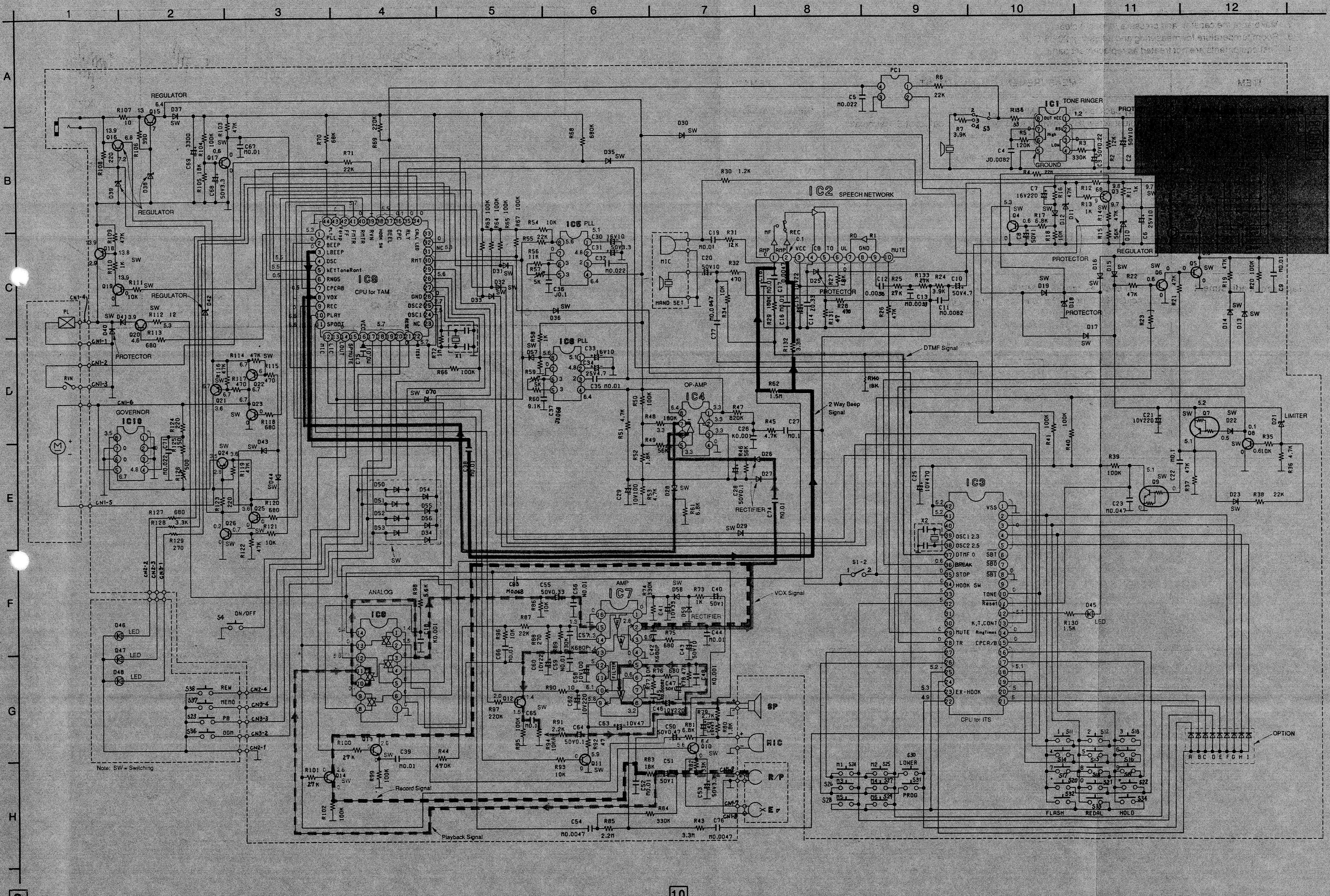

Anode
Cathode

D46, 48

CONNECTION


DC Jack
Cord Holder
Fasten the cord to the holder.
Handset
Handset Cord
Modular Jack for Single Line connection (RJ11C)
Single Telephone Line
AC Adaptor (KX-A11)
Power Outlet (AC120 V, 60 Hz)

SCHEMATIC DIAGRAM


1
2
3
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7
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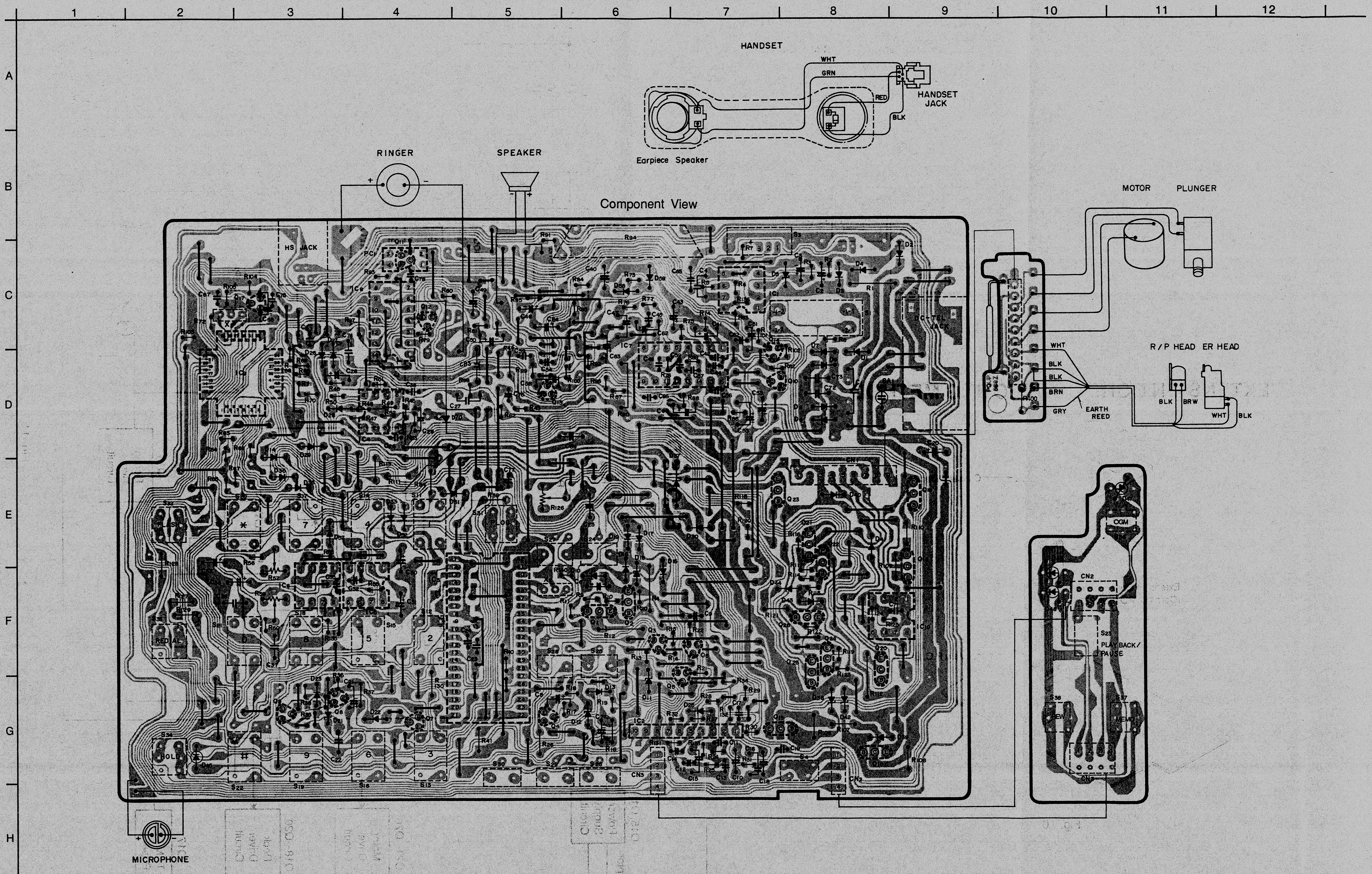
9
10
11
12
A
B
C
D
E
F
G
H
REGULATOR
PROTECTOR
GOVERNOR
IC10
IC9
CPU for TAM
IC5 PLL
IC6 PLL
IC4
OP-AMP
IC2 SPEECH NETWORK
IC1 TONE RINGER
IC3
CPU for ITS
IC8
ANALOG
IC7
AMP
RECTIFIER
LIMITER
LED
OPTION
DTMF Signal
2 Way Beep Signal
VOX Signal
Record Signal
Playback Signal
HAND SET
MIC
SP
MIC
R/P
Er
FLASH
REDIAL
HOLD
LOWER
PROG
REW
MEMO
PB
OGM
S4 ON/OFF
PC1
GROUND
Note: SW = Switching

[redacted]

CIRCUIT BOARD AND WIRING CONNECTION DIAGRAM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9
10
11
12
A
B
C
D
E
F
G
H
HANDSET
WHT
GRN
RED
BLK
HANDSET JACK
Earpiece
Speaker
RINGER
SPEAKER
Component View
MOTOR
PLUNGER
HS JACK
DC-TEL JACK
WHT
BLK
BLK
BRN
GRY
EARTH REED
R/P HEAD
ER HEAD
BLK
BRW
WHT
BLK
OGM
CN2
S23
PLAY BACK/PAUSE
CN3
MICROPHONE

This circuit board may be modified at any time with the development of new technology.

■ FOR SCHEMATIC DIAGRAM

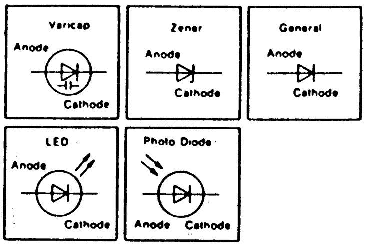
1. S1: Hook switch in "OFF-HOOK" position.
2. S3: Ringer volume selector switch in "HIGH" position.
3. S4: Power on/off switch in "OFF" position.
4. S11~19, 21, 22: Dialing switch.
5. S20: Tone switch.
6. S23: Playback/Pause switch.
7. S24, 26, 27, 29: Direct call switch.
8. S25: Pause switch.
9. S28: Clear switch.
10. S30: Lower switch.
11. S31: Program switch.
12. S32: Flash switch.
13. S33: Redial switch.
14. S34: Hold switch.
15. S36: OGM switch.
16. S37: Memo/2 way switch.
17. S38: Rewind switch.
18. DC voltage measurement are taken with an electronic voltmeter from negative line.

Add 40 mA to telephone line from the loop simulator.
Off-Hook condition.

This schematic diagram may be modified at any time with the development of new technology.

Important safety notice

The shaded area on this schematic diagram incorporates special features important for protection from fire and electrical shock hazards.
When servicing it is essential that only manufacturer's specified parts be used for the critical components in the shaded area of the schematic.


Varicap
Anode
Cathode
Zener
Anode
Cathode
General
Anode
Cathode
LED
Anode
Cathode
Photo Diode
Anode
Cathode

EXTENSION CORD CONNECTING METHOD

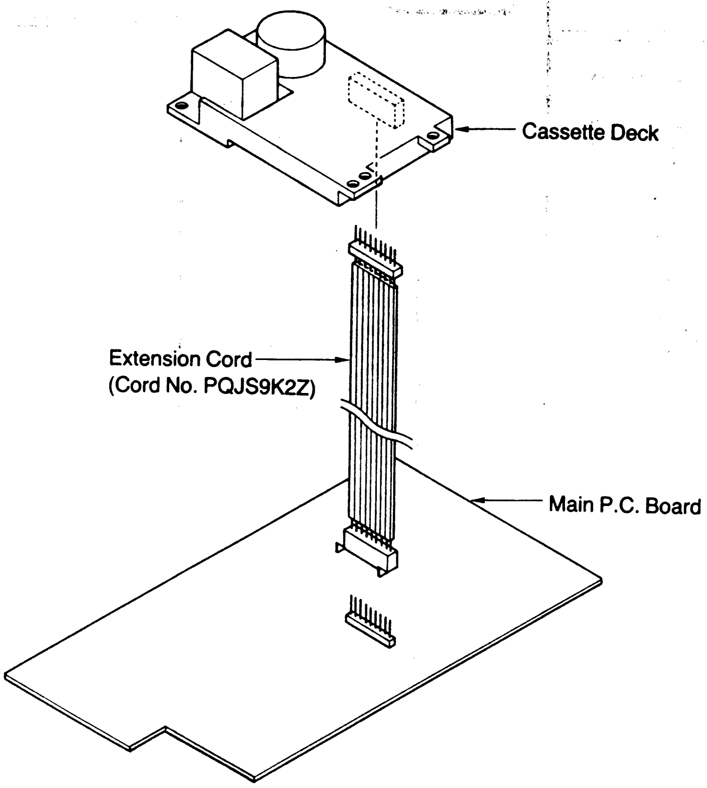

Cassette Deck
Extension Cord
(Cord No. PQJS9K2Z)
Main P.C. Board

Fig. 10

BLOCK DIAGRAM

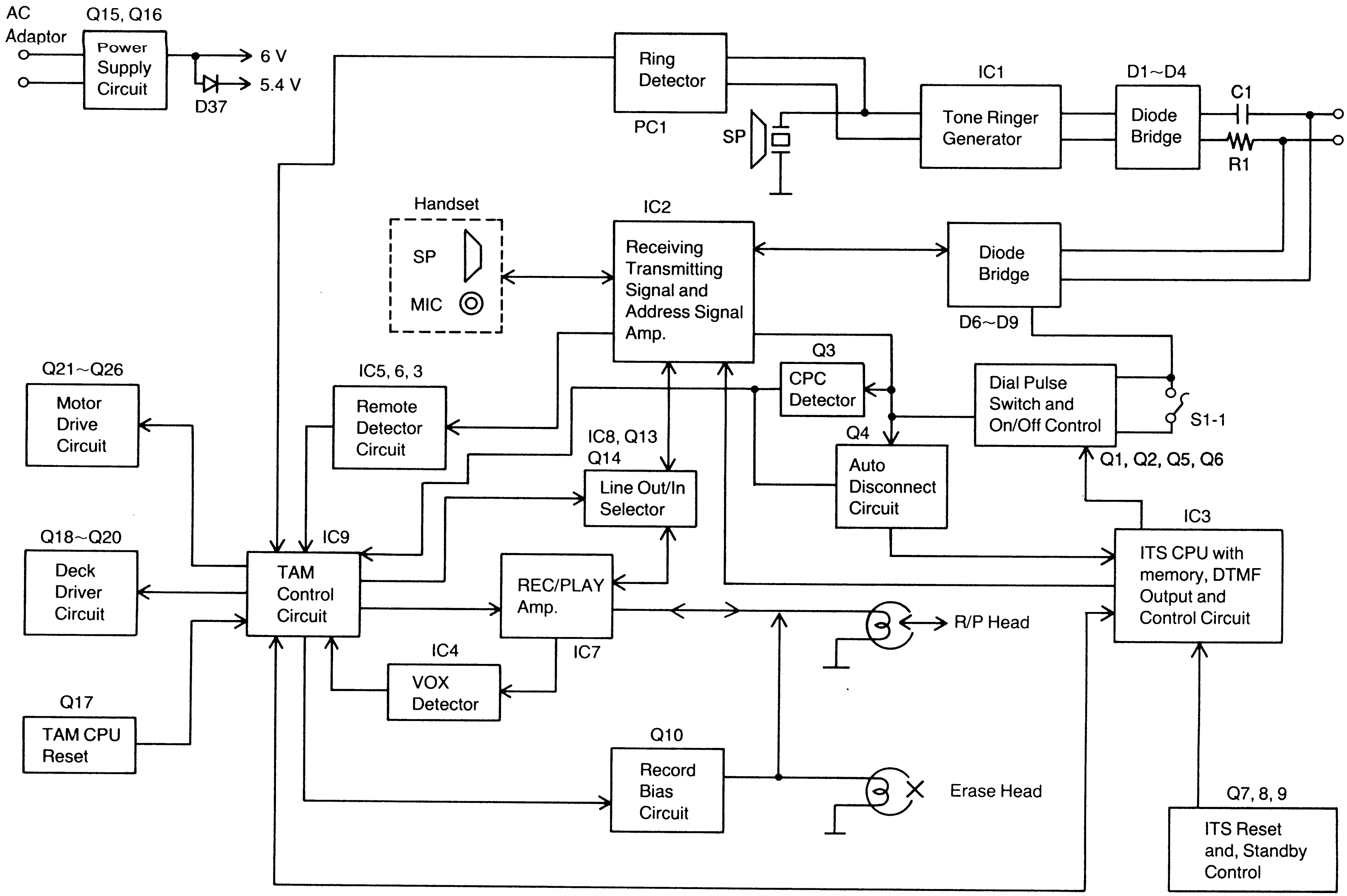

AC Adaptor
Q15, Q16
Power Supply Circuit
6 V
5.4 V
D37
Ring Detector
PC1
SP
IC1
Tone Ringer Generator
D1~D4
Diode Bridge
C1
R1
T
P
Handset
SP
MIC
IC2
Receiving Transmitting Signal and Address Signal Amp.
Diode Bridge
D6~D9
Q21~Q26
Motor Drive Circuit
IC5, 6, 3
Remote Detector Circuit
Q3
CPC Detector
Dial Pulse Switch and On/Off Control
S1-1
IC8, Q13
Q14
Line Out/In Selector
Q4
Auto Disconnect Circuit
Q1, Q2, Q5, Q6
Q18~Q20
Deck Driver Circuit
IC9
TAM Control Circuit
REC/PLAY Amp.
IC3
ITS CPU with memory, DTMF Output and Control Circuit
R/P Head
IC4
VOX Detector
IC7
Q17
TAM CPU Reset
Q10
Record Bias Circuit
Erase Head
Q7, 8, 9
ITS Reset and, Standby Control

Fig. 11

CIRCUIT OPERATIONS

Note: The circuit diagram may be modified at any time with the development of new technology.

■ TELEPHONE LINE INTERFACE

When the hook-switch S1-1 is ON (off-hook), the circuit is closed, and current is supplied to the base of Q2 via the diode bridge D6~9 and R8.
Q1 and Q2 are the dial pulse generating circuits, and are driven by the CPU (IC3), when the CPU pin 36 is ON (Low) → Q6 is OFF → Q5 is ON and Q1 is OFF. (break)
If pin 36 is OFF (High) → Q6 is ON → Q5 is OFF → Q2 and Q1 are ON. (make)

The ring signal is outputted from pin 8 of IC1, and its volume is adjusted in 3 steps (H-L-OFF) by S3, then impressed on the ceramic sound generator, and so is generated.

R2	Bell sensitivity adjustment
R4, C4	Bell frequency setting fH1, fH2
R3, C3	Repeat frequency setting fL

fH1, fH2, fL are derived from the following formula:

$$fH1 = \frac{1}{1.227 \times R4 \times C4} = 828 \text{ Hz} \qquad fL = \frac{1}{1.273 \times R3 \times C3} = 10.8 \text{ Hz}$$

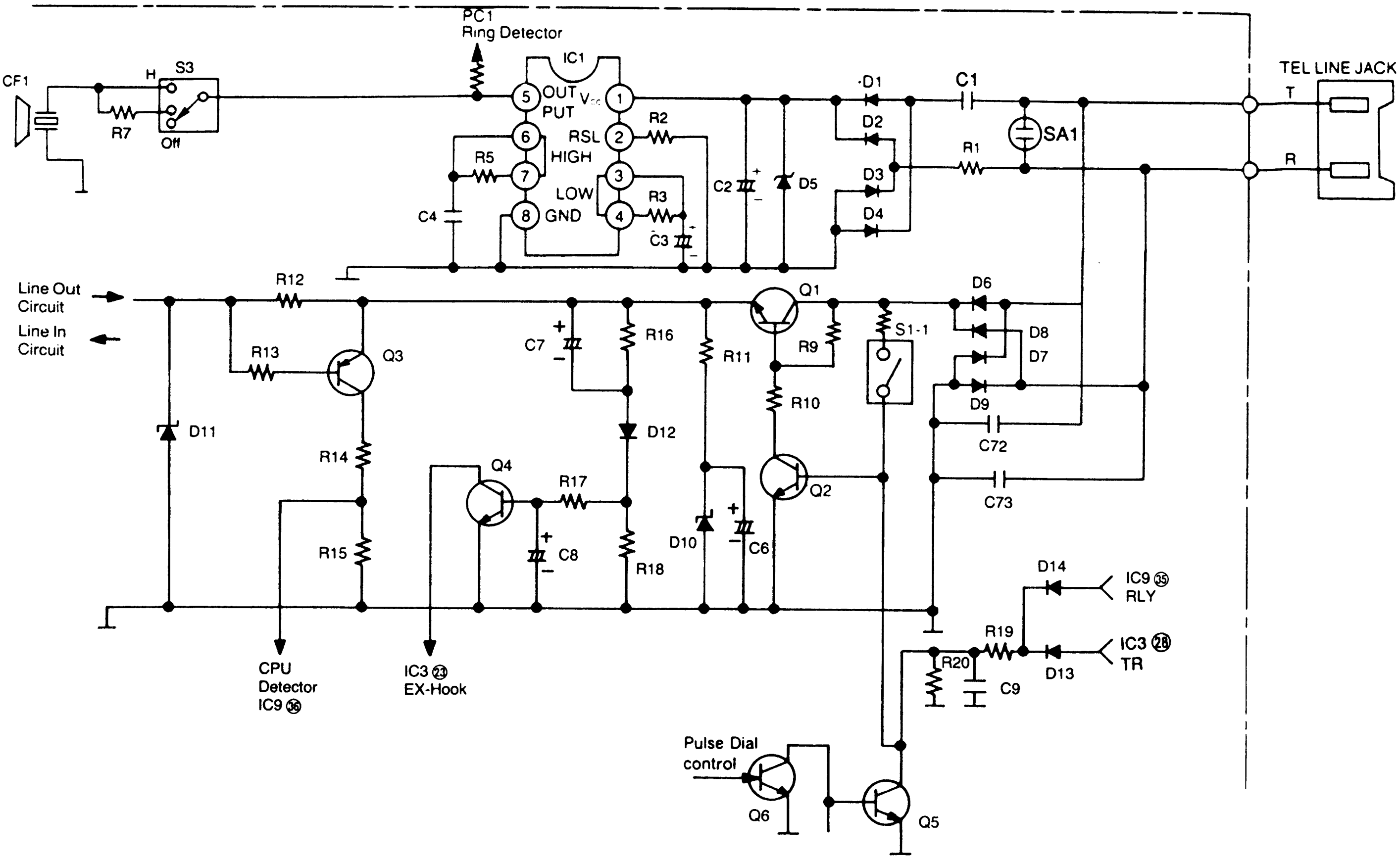
R4 = 120 K
C4 = 0.0082 μF

R3 = 330 K
C3 = 0.22 μF

fH2 = 1.26 X fH1 = 1044 Hz

The following shows the waveform of the tone ringing IC output:

Circuit Diagram


PC1
Ring Detector
IC1
CF1
H
S3
R7
Off
OUT PUT
Vcc
RSL
HIGH
LOW
GND
1
2
3
4
5
6
7
8
R2
R3
R5
C4
C3
C2
D5
D1
C1
D2
D3
D4
SA1
R1
TEL LINE JACK
T
R
Line Out Circuit
Line In Circuit
R12
R13
Q3
D11
R14
R15
Q1
R9
S1-1
D6
D8
D7
D9
C72
C73
C7
R16
R11
R10
Q2
D12
Q4
R17
C8
R18
D10
C6
D14
IC9 ㉟
RLY
R19
IC3 ㉘
TR
D13
R20
C9
CPU Detector
IC9 ㊱
IC3 ㉓
EX-Hook
Pulse Dial control
Q6
Q5

TONE DIAL CIRCUIT

Function:

The tone dialing circuit consists of a DTMF (Dual Tone Multi Frequency) signal generator (outputted from pin 14 of the microprocessor) for tone dialing, and also a circuit for outputting the signal to the line.
The DTMF circuit identifies inputs from the 12 keys (1,2,3,4,5,6,7,8,9, * and #) by means of a total of seven frequencies, that is four low frequencies (Low group) and three high frequencies (High group).

Circuit Operation:

When a dial key is pressed, a DTMF signal is outputted from pin 37 of IC1 as an analog synthetic wave.
The signal flow to the line is as follows.
Pin 37 of IC3 →R29, C17 →pin 1 of IC2 → pin 6 of IC2→ R12→ Q1 collector → Q1 emitter → Diode bridge (D6~9)→ Telephone Line.
Show below is the signal flow used to output the DTMF signal from the handset as a monitor tone when a dial key is pressed.
Pin 37 of IC3 → R34, C20 → Handset Speaker.
The signal combination and frequency corresponding to each dial key is shown below.

Tone Frequencies

High Group / Low Group	H1	H2	H3
L1	1	2	3
L2	4	5	6
L3	7	8	9
L4	*	0	#

Low Group	Frequencies	High Group	Frequencies
L1	697 Hz± 1.5%	H1	1209 Hz± 1.5%
L2	770 Hz± 1.5%	H2	1336 Hz± 1.5%
L3	852 Hz± 1.5%	H3	1477 Hz± 1.5%
L4	941 Hz± 1.5%		

Circuit Diagram.....Refer to page 18.

■ ITS RESET AND STAND BY CONTROL CIRCUIT

Function:

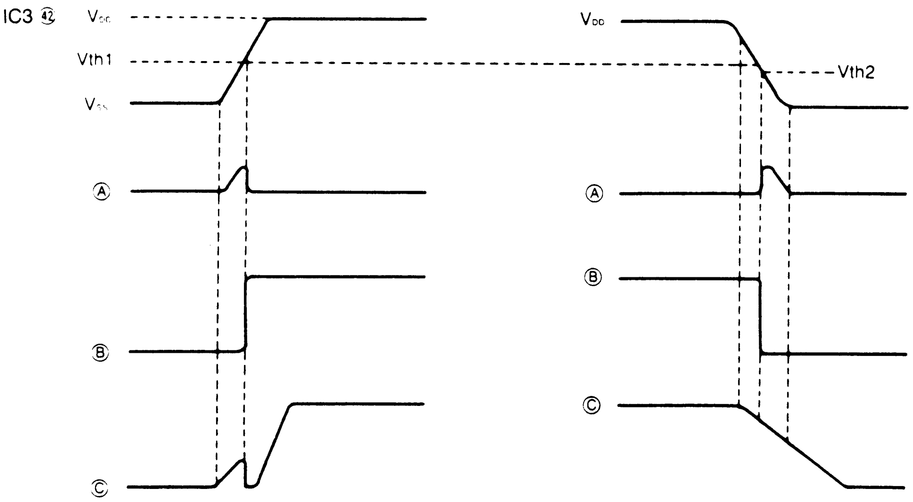
In order to hold the contents of the memory of IC3, the unit is designed so that it goes into the Stop mode when the power is cut off (memory backup mode:CPU clock stops in order to reduce power consumption).

Circuit Operation:

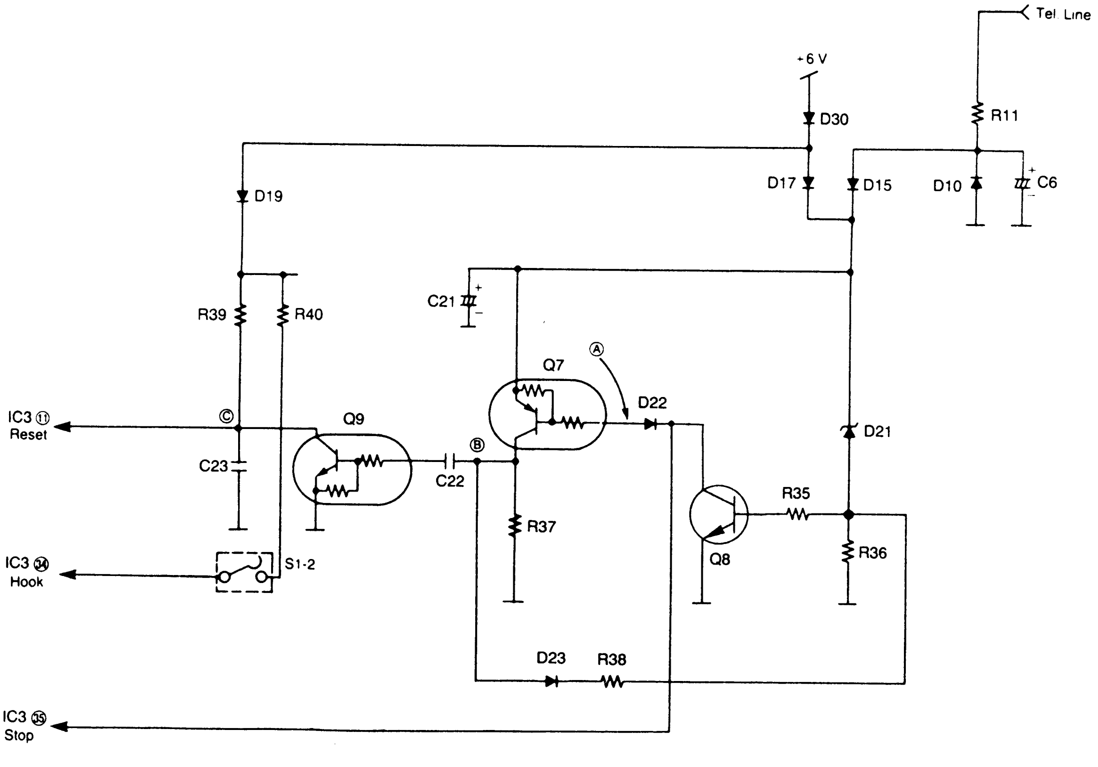
Timing charts A to C are shown.

1) When the power is switched ON, the voltage will gradually rise unit it reaches Vth 1, whereupon IC3 pin 11 input port changes from a "L" → "H", and a reset as applied. Simultaneously, a "L" is inputted to IC3 pin 35 the stop input port, causing the stop mode to be cleared.
2)When the power is cut off, the voltage falls until it reaches Vth 2, whereupon a "H" is inputted to IC3 pin 35, and IC3 enters the stop mode to reduce power consumption, so that only memory hold current is supplied.

1) When the power is switched on.   2) When the power is cut off.



Circuit Diagram


Tel Line
+6 V
D30
R11
D19
D17
D15
D10
C6
C21
R39
R40
Q7
Ⓐ
D22
IC3 ⑪
Reset
Ⓒ
Q9
Ⓑ
D21
C23
C22
R35
R37
R36
Q8
IC3 ㉞
Hook
S1-2
D23
R38
IC3 ㉟
Stop

■ HANDSET RECEPTION CIRCUIT

Each signals are sent to the telephone line as follows.

- **Reception**

Telephone Line → D6~9 → Q1 → R12 → C10 → R24 → R133 → R25 →C12 → IC2 pin 9 → IC9 pin 7 → R32 → C20 → Handset Speaker.

- **Transmission**

Handset Mic → C19 → R31 → IC2 pin 2

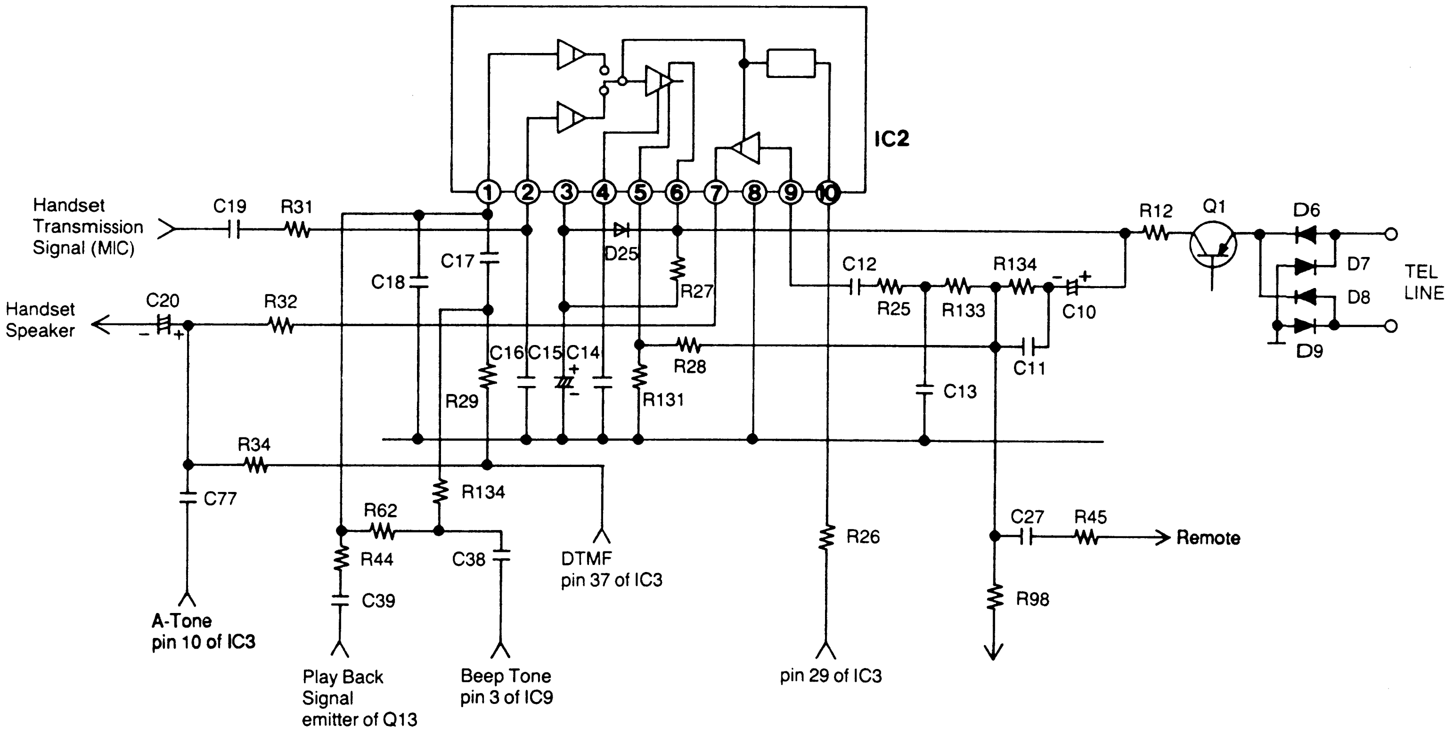
- **DTMF**

IC3 pin 37 → R34 → C20 → Handset Speaker.

- **A Tone**

IC3 pin 10→ C17 → C20 → Handset Speaker.

Circuit Diagram


IC2
1
2
3
4
5
6
7
8
9
10
Handset Transmission Signal (MIC)
C19
R31
Handset Speaker
C20
R32
C18
C17
D25
R27
C16
C15
C14
R29
R131
R28
R34
C77
A-Tone pin 10 of IC3
R134
R62
R44
C38
C39
Play Back Signal emitter of Q13
Beep Tone pin 3 of IC9
DTMF pin 37 of IC3
C12
R25
R134
R133
C10
C11
C13
R26
pin 29 of IC3
C27
R45
Remote
R98
R12
Q1
D6
D7
D8
D9
TEL LINE

LINE OUTPUT CIRCUIT

Each signals are sent to the telephone line as follows.

- (Beep Tone) IC9 pin 3 → C38 → R62 → IC2 pin 1
- (2 way Tone) IC9 pin 3 → C38 → R134 → IC2 pin 1
- (Tape Playback Signal) Q13 emitter → C39 → R44 → IC2 pin 2
- (Handset Signal) Handset Mic → C19 → R31 → IC2 pin 2
- (DTMF) IC3 pin 37 → R29 → C17 → IC2 pin 1 → IC2 pin 6 → R12 → Q1 → D6~9 → Telephone Line.

Circuit Diagram...See page 18.

POWER SUPPLY CIRCUIT

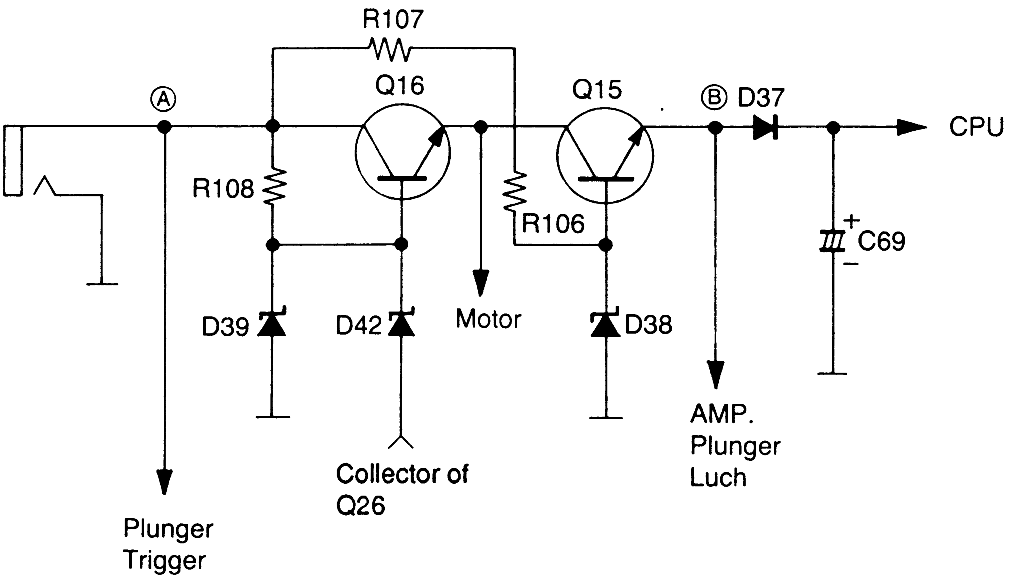
Function:

Power from the AC adapter Passes through the 2-stage regulating block consisting of Q15, and provides system voltages of 6 V and 5.4 V.

Circuit Operation:

Power from the AC Adapter is supplied directly to the plunger trigger (A). Q15 is the second stage regulated power supply. The voltage at point B is regulated to 6 V by the 6.8 V zener voltage of D38. The 6 V voltage is shifted by D37 to 5.4 V which is used to power the CPU, etc.

Circuit Diagram

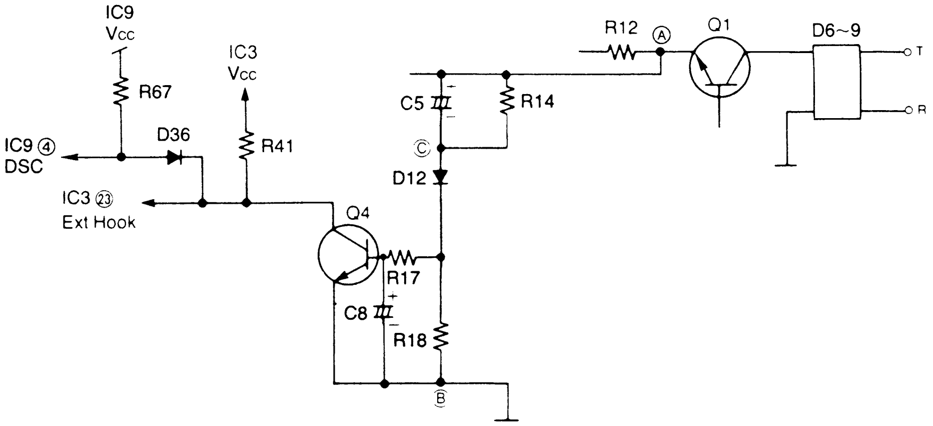

R107
Ⓐ
Q16
Q15
Ⓑ D37
CPU
R108
R106
C69
D39
D42
Motor
D38
AMP.
Plunger
Luch
Collector of
Q26
Plunger
Trigger

CLEARING THE HOLD STATUS AND AUTO DISCONNECT CIRCUIT

Function:
When line recording is taking place in the Hold status or a TAM ANSWER status, this unit will detect the OFF-Hook status of another telephone connected in parallel with the line and then clear the Hold status, and stops recording.

Circuit Operation:
When the unit seizes a line a voltage will be applied between points A and B. At this time a voltage will be applied to the base Q4, causing Q4 to turn ON. As a result, the collector of Q4 will go Low, and a Low status will be inputted to IC3 pin 23 and IC9 pin 4, thus detecting the fact that the unit has seized the line. Then, when the parallel-connected telephone does into an OFF-Hook status, the voltage between A and B will fall. However, the charge on C5 causes the previous voltage between A and C to be retained, hence the voltage between C and B falls. Consequently, the base potential of Q4 falls, causing Q4 to turn OFF and IC3 pin 23 and IC9 pin 4 to go High, thus detecting the fact that the parallel-connected telephone is in an OFF-Hook status.

Circuit Diagram

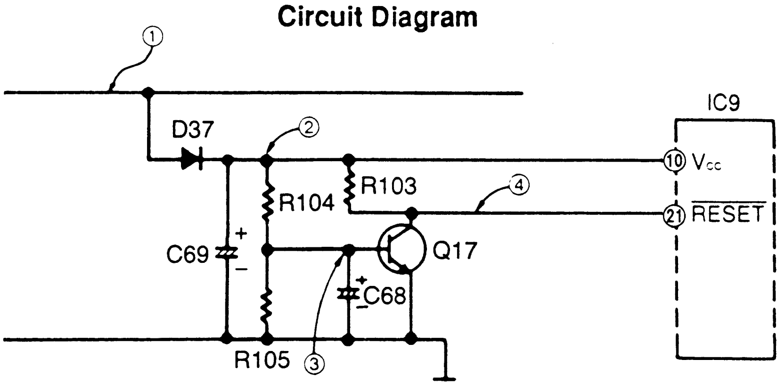


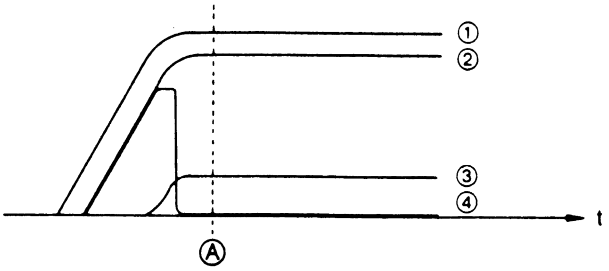
INITIALIZE CIRCUIT

Function:
This circuit is used for initializing the microcomputer when the AC adaptor is applied.

Circuit Operation:
When the unit is switched ON. Then the voltage is shifted by D37 and power is supplied to the CPU.
The voltage needed to reset the CPU is supplied from the collector of Q17.
When Q17 becomes ON and the reset terminal voltage drops the CPU has been reset, and the set can operate beyond point A in the circuit voltage diagram.

Circuit Diagram





■ OGM END DETECTOR CIRCUIT

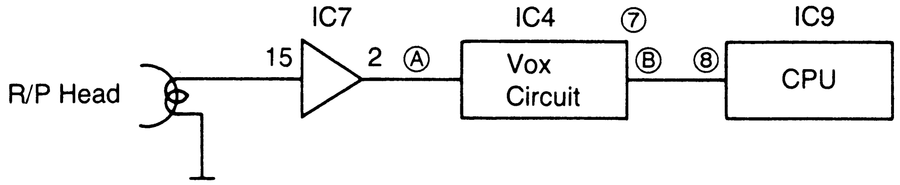
Circuit Operation:

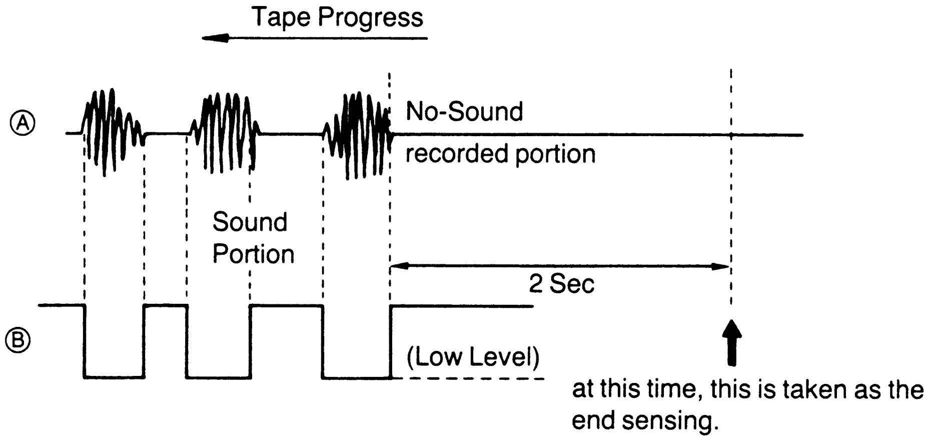
When the OGM Button is pressed upon completion of the OGM recording, no sound signals are recorded on the tape, the tape sound track continues to the end and stopped.

A no-sound detection system is used during playback. If a no-sound condition exists for 2 seconds, the unit will sense it as the of the OGM tape. The no-sound detection is composed by the vox circuit. (IC4 pin 7 ; sound output...a low level, no-sound...a high level)

The sensing tape detection system is judged by pin 8 of IC9.

Circuit Diagram


IC7
IC4
⑦
IC9
R/P Head
15
2
Ⓐ
Vox Circuit
Ⓑ
⑧
CPU


Tape Progress
Ⓐ
No-Sound recorded portion
Sound Portion
2 Sec
Ⓑ
(Low Level)
at this time, this is taken as the end sensing.

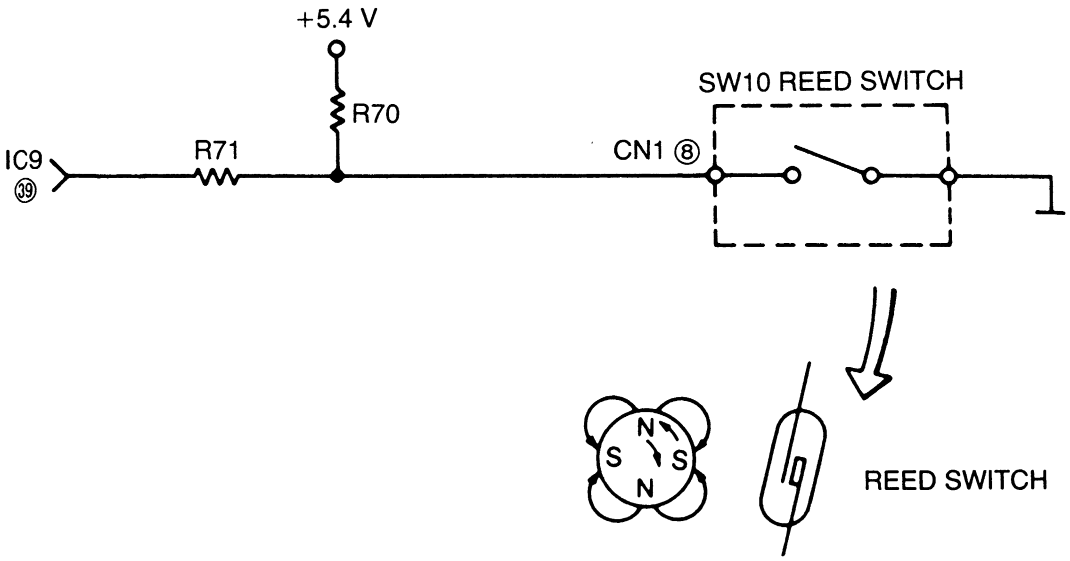
■ ICM TAPE ROTATION DETECTOR CIRCUIT

Circuit Operation:

The changes in the direction of the magnetic field caused by the ratation of the four-pole ferrite magnet are detected by the Reed Switch; this output is to the microcomputer input.

Reed Switch→R71→IC9 pin 39

Circuit Diagram


+5.4 V
R70
IC9
㊴
R71
CN1 ⑧
SW10 REED SWITCH
N
S
S
N
REED SWITCH

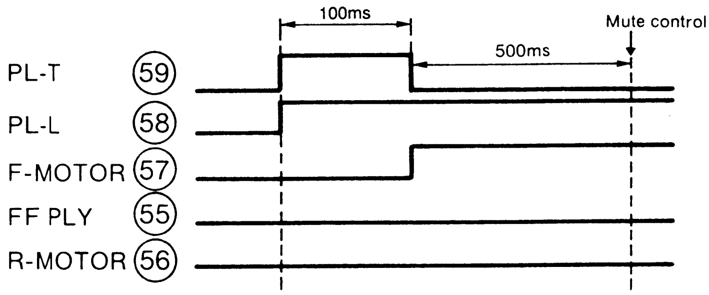
TAPE TRANSPORT CONTROL

Circuit Operation:

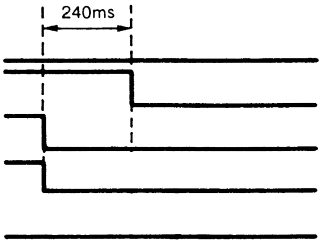
The timing for the plunger and motor which are used to operate the deck is as shown in the timing chart.

Timing Chart

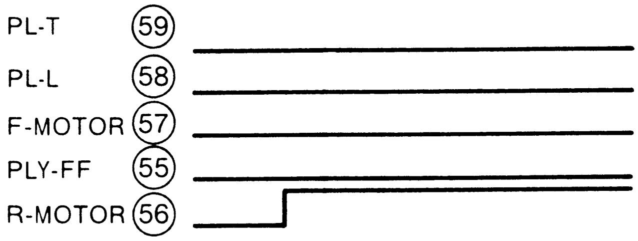
• PLAY/REC


100ms
Mute control
500ms
PL-T ㊴59
PL-L (58)
F-MOTOR (57)
FF PLY (55)
R-MOTOR (56)

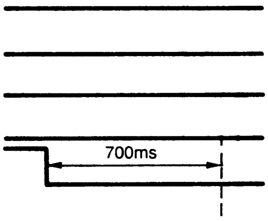
• STOP



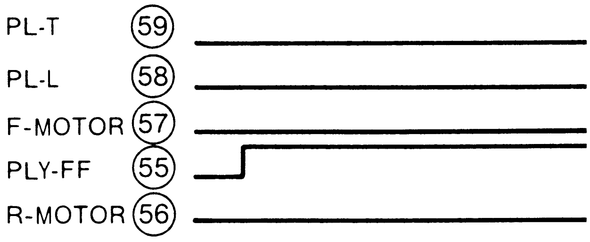
• REW


PL-T (59)
PL-L (58)
F-MOTOR (57)
PLY-FF (55)
R-MOTOR (56)

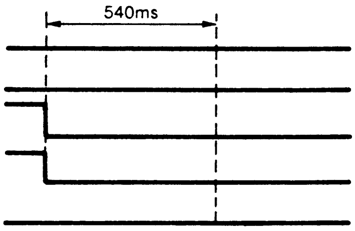
• STOP



• FF


PL-T (59)
PL-L (58)
F-MOTOR (57)
PLY-FF (55)
R-MOTOR (56)

• STOP



■ RING DETECTOR CIRCUIT

Function:

This circuit activates the CPU to the ring signal from the telephone line during the ANSWER mode of operation.

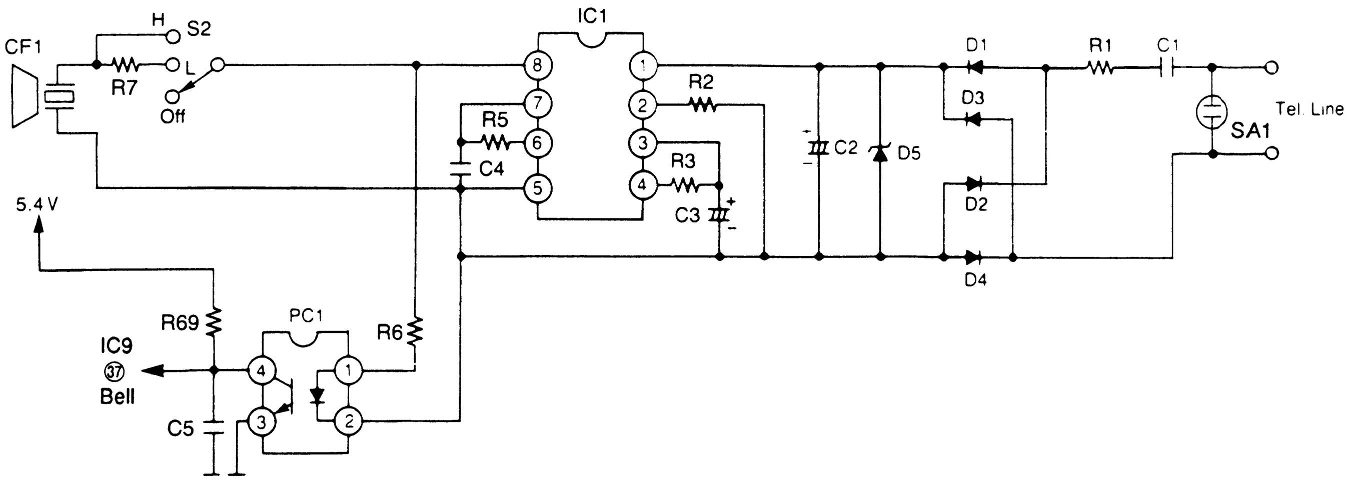
Circuit Operation:

When a Ring Signal is inputted from the telephone line, a tone (ring signal) will be outputted from IC1 pin 8. (See telephone line interface.)

This ring signal flows through R6 → PC1 pin 2, hence photocoupler → PC1 pin 4~3 will turn ON.

As a result, IC9 pin 37 goes Low, indicating that Ring Signal was inputted.

Circuit Diagram



■ RECORD CIRCUIT (OGM, ICM)

Circuit Operation:

(Recrding Signals)

Recording input signals from the telephone line or MIC is selected by IC8.

The signal from the telephone line flows from C10 through C11, then passes through R24, and through pins 1 - 2 of IC8. The signal of the built-in condenser microphone goes to IC8 via R81 and C50.

The selected input signals are amplified an amplifier which consists of IC7, R88, C59, R87, IC7, R69, C57 and C55. The other output goes to the MONITOR CIRCUIT through Q12, C65, and R95.

The same signal amplified by the Buffer Amplifier is recorded by the head.

The signal goes through IC8, and the ALC CIRCUIT (which consists of C40, R73, D58, D59, R74, C41 and IC7).

(ALC)

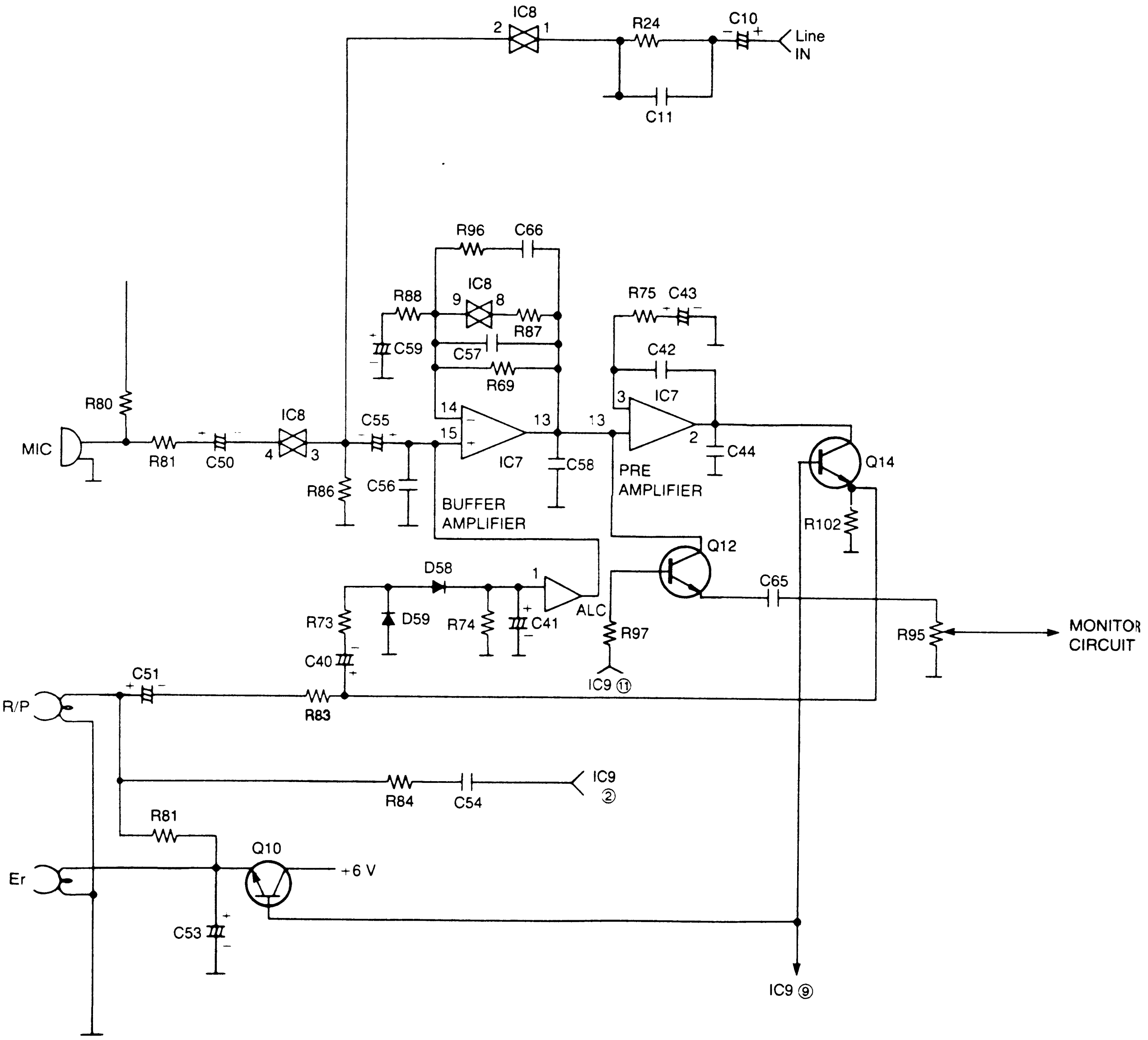
IC7 contains ALC.

When the Detector Circuit which consists of C40, R73, D58, D59, R74 and C41 detects the output of IC7 pin 2 (Buffer Amplifier) an input is developed to IC7 pin 1, and the ALC activates.

(Signal)
The beep tone generated by IC9.
The beep tone of the ICM recording (from pin 33 of IC9) is processed to the ICM recording head via R84, C54.

(Erase)
When in the Rec mode, pin 22 of IC9 is High.
The voltage is applied to the Erase Head, thus the Erase Head is activated.
The bias current is applied the R/P Head via R82.

Circuit Diagram

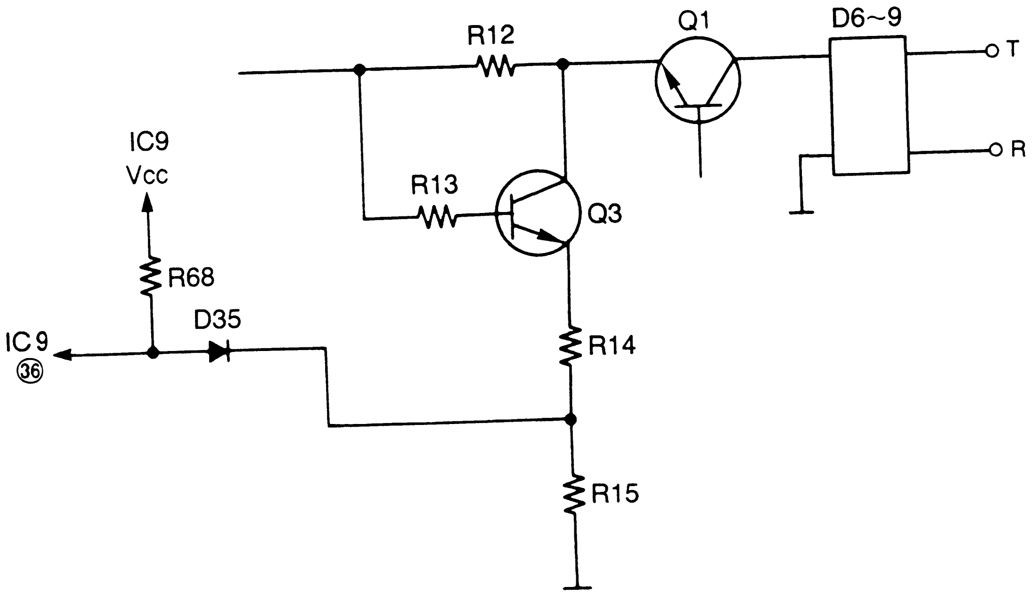

IC8
2
1
R24
C10
Line IN
C11
R96
C66
IC8
R88
9
8
R87
C59
C57
R69
R75
C43
C42
IC7
R80
MIC
R81
C50
IC8
4
3
C55
14
15
13
13
3
2
C44
Q14
R86
C56
IC7
C58
BUFFER AMPLIFIER
PRE AMPLIFIER
R102
Q12
D58
1
ALC
C65
R73
D59
R74
C41
R97
R95
MONITOR CIRCUIT
C40
C51
IC9 ⑪
R/P
R83
R84
C54
IC9 ②
R81
Q10
+6 V
Er
C53
IC9 ⑨

CPC (CALLING PARTY CONTROL) DETECTOR CIRCUIT

unction:
he CPC DETECTOR complements the units shut off, in the ANSWER mode, after the caller hangs up. At this time, e CPC DETECTOR takes over. The CPC DETECTOR senses the temporary disconnection of the telephone line hich occurs after the caller hangs up.

ircuit Operation:
/hen the unit seizes a line, current will flow through D6~9, Q1 and R12. As a result, voltage will be applied across oth ends of R12, causing current to flow to the base of Q3 via R13, causing Q3 will turn ON. Consequently, voltage ill be applied across both ends of R14 and R15. As a result, **IC9 pin 36 will go High through D35. If then the line is** omentarily cut, line current will cease to flow, and voltage will no longer be applied across R12, thus and Q3 will turn FF. IC9 pin 36 will go Low, hence this condition will be detected.

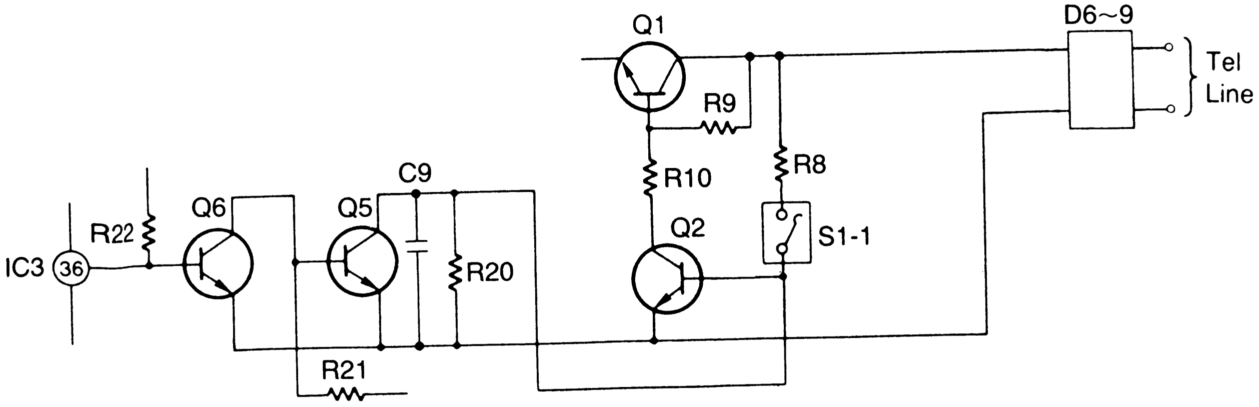
Circuit Diagram



■ PULSE DIAL CIRCUIT

Circuit OPeration:
The dial pulses are generated by the CPU (IC3), and reach the telephone line via the following path; pin 36 of IC3 → Q6 → Q5 → Q2 → R10 → Q1 → D6~9 → Telephone Line.

Circuit Diagram



VOX CIRCUIT

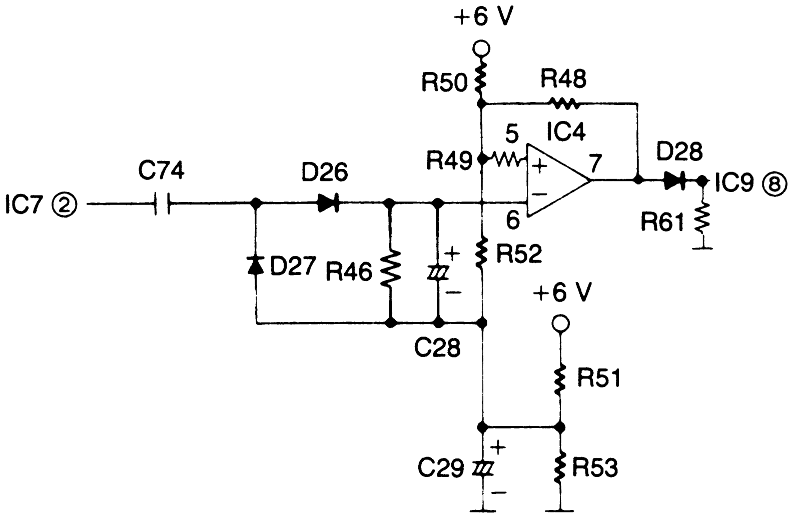
Function:

The vox circuit is designed to detect cyclic signals in which the signal is ON for 100 msec. to 1 sec, continuous sounds and no-sound at all.
After detection, the CPU issues an instruction that makes VOX operation possible.
This means that when a telephone call has ended, the phone is reset and is ready to receive the next call.

Circuit Operation:

A signal output from terminal pin 2 of IC7 passes through C74, then it is rectified by C28, R46, D26, and D27 inputted to the comparator which consists of IC4 pin 7, R50 and R52. The output from IC4 pin 7 is inputted to pin 8 of the CPU (IC9). When sound is pressent, the output at IC4 pin 7 becomes a low level, while with no-sound its output becomes a high level.

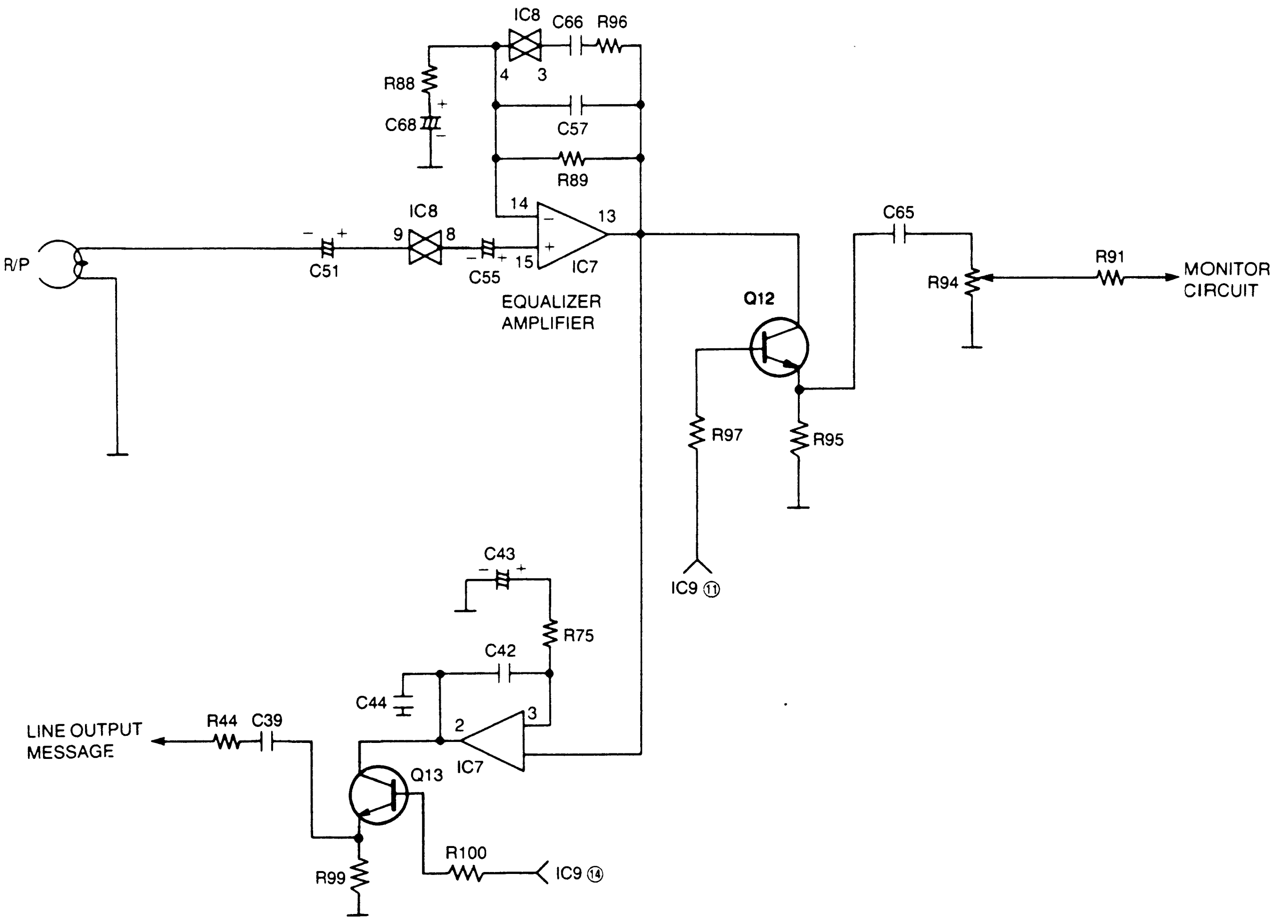
Circuit Diagram



■ PLAYBACK CIRCUIT (OGM, ICM MESSAGE)

Circuit Operation:
The selected signal is to fed to an equalizer amplifier IC7 via C51, IC8 and IC7 sends the signal to the Monitor Circuit through IC8, C65, R94 and R91.
The signal amplified by the buffer amplifier is provided to telephone line through IC7, Q13, C39, R44, line output circuit.
R96, C66, R89, C68, IC8, C57 and R88 are components which are necessary for the equalizer amplifier.

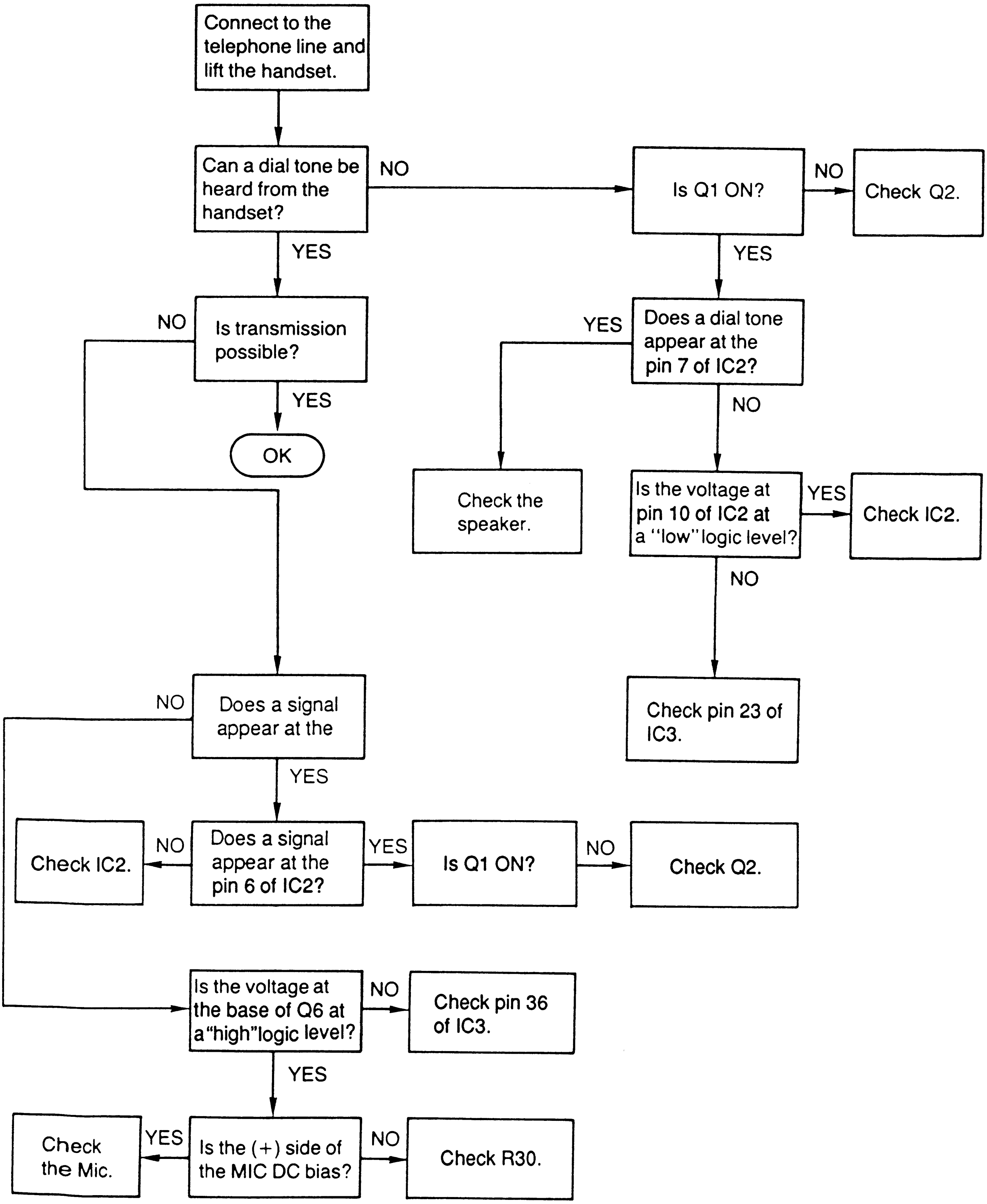
Circuit Diagram


IC8
C66
R96
R88
4
3
C68
C57
R89
IC8
14
13
9
8
R/P
C51
C55
15
IC7
EQUALIZER
AMPLIFIER
Q12
C65
R91
MONITOR
CIRCUIT
R94
R97
R95
IC9 ⑪
C43
R75
C42
C44
3
2
LINE OUTPUT
MESSAGE
R44
C39
Q13
IC7
R100
IC9 ⑭
R99

TROUBLESHOOTING GUIDE

■ INTEGRATED TELEPHONE SYSTEM SECTION

1) TRANSMISSION PROBLEMS


Connect to the telephone line and lift the handset.
Can a dial tone be heard from the handset?
NO
Is Q1 ON?
NO
Check Q2.
YES
YES
NO
Is transmission possible?
YES
Does a dial tone appear at the pin 7 of IC2?
YES
OK
NO
Check the speaker.
Is the voltage at pin 10 of IC2 at a "low" logic level?
YES
Check IC2.
NO
NO
Does a signal appear at the
Check pin 23 of IC3.
YES
Check IC2.
NO
Does a signal appear at the pin 6 of IC2?
YES
Is Q1 ON?
NO
Check Q2.
Is the voltage at the base of Q6 at a "high" logic level?
NO
Check pin 36 of IC3.
YES
Check the Mic.
YES
Is the (+) side of the MIC DC bias?
NO
Check R30.

TROUBLE SHOOTING GUIDE

■ SERVICE HINTS

SYMPTOM	CURE
Does not rings.	Replace Ceramic Buzzer. (Ref No. E4)
Answering Machine Answers itself.	Check Q15 or Q17 for short.
ICM will not cut off.	Chenge C74 from 0.01Fμ to 0.0068μF or 0.0047μF.
OGM recording distorted.	Check for cold solder joints on IC9.
No PWR/ AFTER PWR fixed no plunger a activation.	Check R111, Q18 and Q19.
Intermittent rewind.	Check AC Adaptor or R71 or R70.
Goes into hold after taking ICM.	Check IC4.
Would not record all OGM.	Check C51.
Handset and MIC muted, won't tone dial.	Check R26.
No OGM.	Check IC9, IC8 and IC7.
C[illegible]n dial out but incoming calls get busy signal.	Check Q1 and SA1.
Holds line constantly.	Check Q1.
Shuts off after OGM.	Check IC2.

■ MOTOR DRIVE CIRCUIT

Playback (or Recording)

When IC9 pin 41 becomes " H " and Q26 ON. And then the motor voltage supplied from Q16 changes to the voltage on playing. When IC9 pin 41 becomes " H " Q26 ON → Q24, Q22 ON thus the governor (IC10) is actived and the motor voltage is regulated, hence the motors at a constant speed.

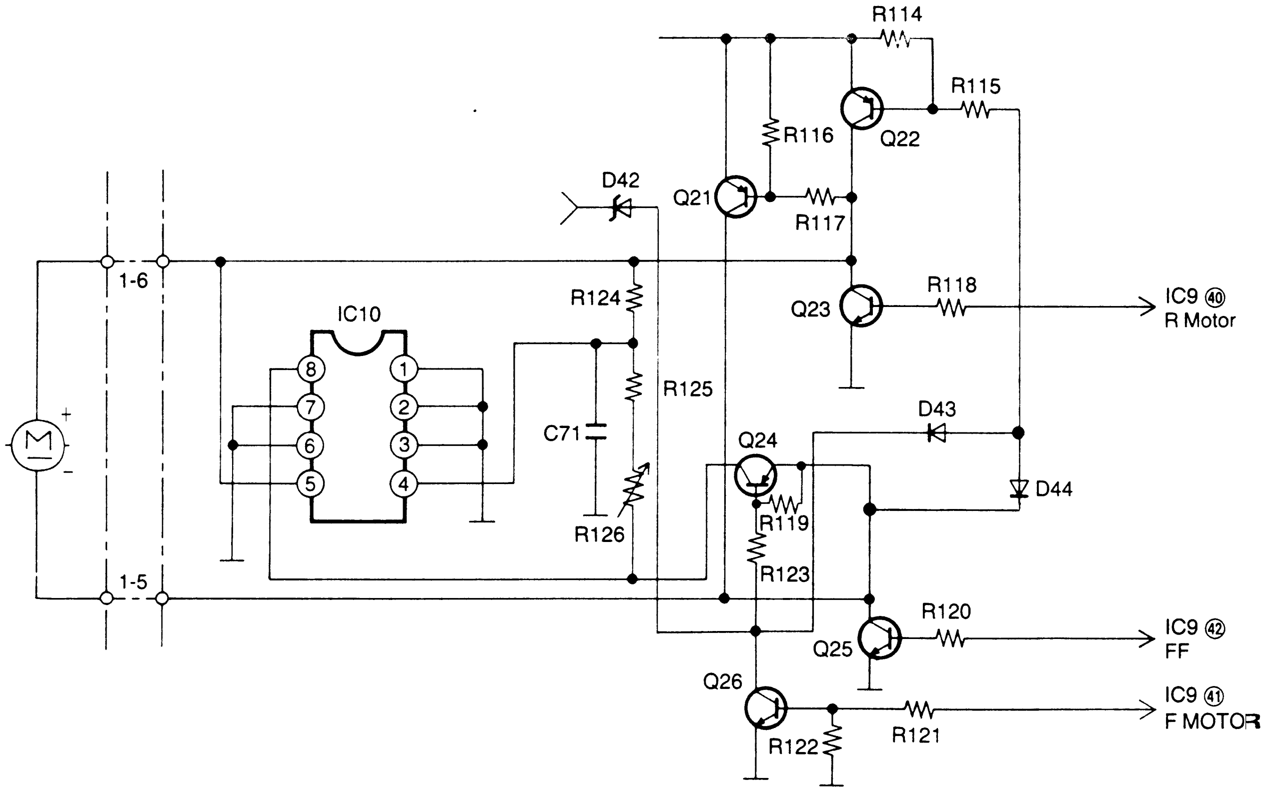
Fast Forward

IC9 pin 42 " H " → Q25 ON → Q22 ON, and the motor current flows through Q22 → Motor → Q25 and the motor is rotated at high speed.

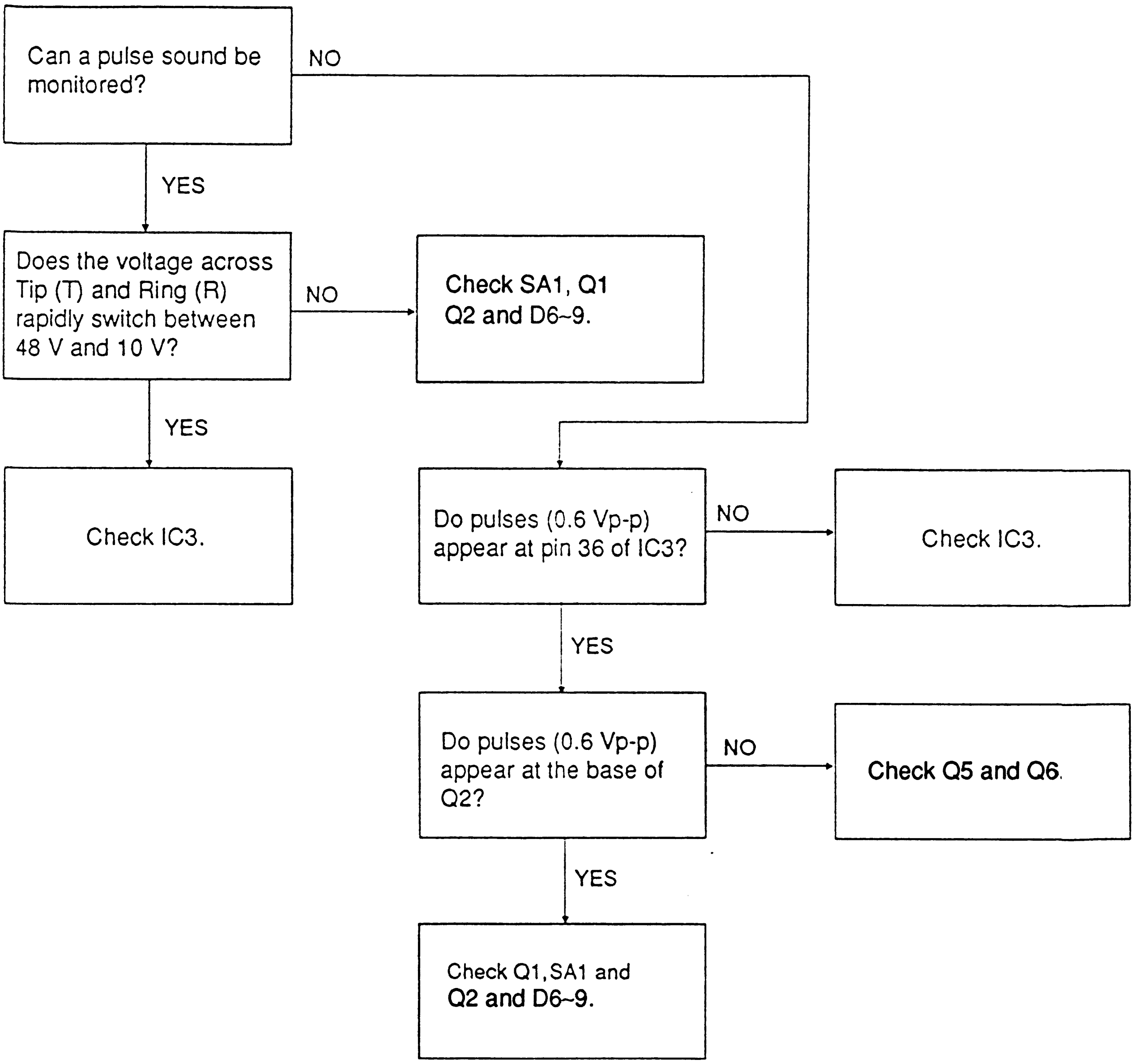
Rewind

When IC9 pin 40 becomes " H " Q23 goes ON. Q21 also goes on, and the motor current flows through Q21 → Motor → Q23. Because this is the reverse direction to the current which flows in the above Fast Forward mode, the motor rotates at high speed in the reverse direction.

Circuit Diagram

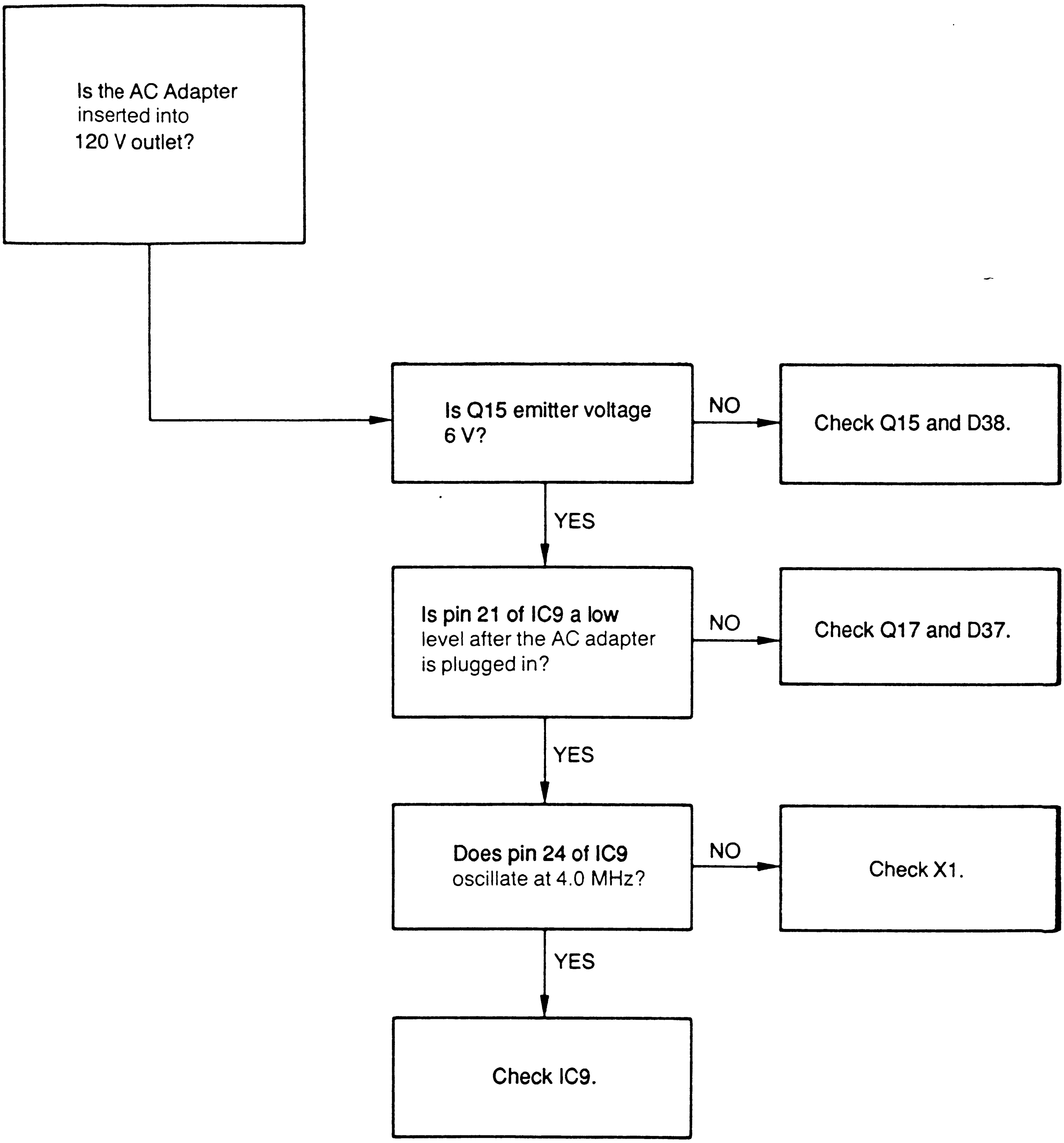

R114
R115
R116
Q22
D42
Q21
R117
1-6
R124
IC10
Q23
R118
IC9 ㊵
R Motor
8
7
6
5
1
2
3
4
+
M
-
R125
C71
Q24
D43
D44
R126
R119
R123
1-5
R120
Q25
IC9 ㊷
FF
Q26
IC9 ㊶
F MOTOR
R121
R122

2) PULSE DIALING PROBLEMS

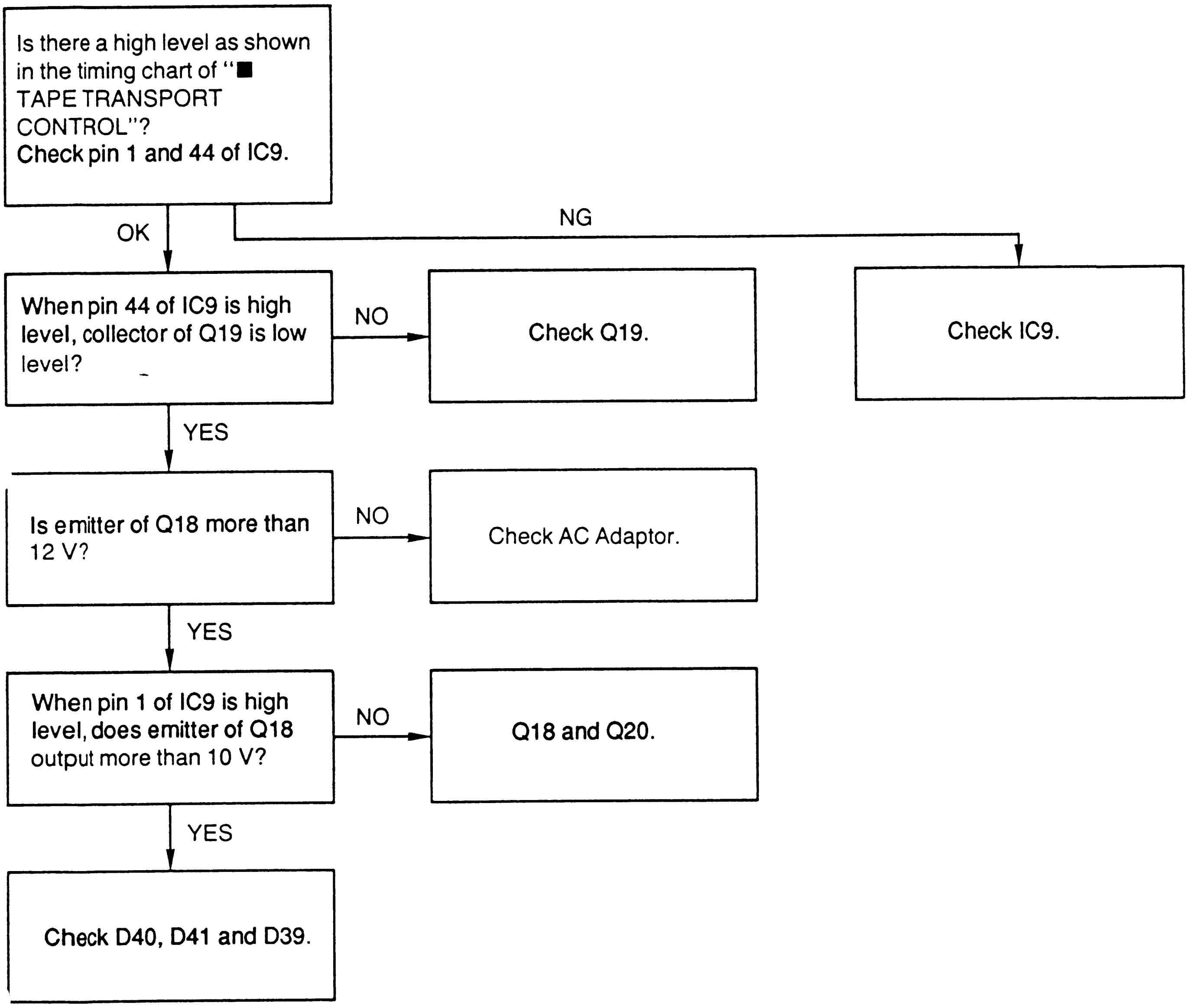

Can a pulse sound be monitored?
NO
YES
Does the voltage across Tip (T) and Ring (R) rapidly switch between 48 V and 10 V?
NO
Check SA1, Q1 Q2 and D6~9.
YES
Check IC3.
Do pulses (0.6 Vp-p) appear at pin 36 of IC3?
NO
Check IC3.
YES
Do pulses (0.6 Vp-p) appear at the base of Q2?
NO
Check Q5 and Q6.
YES
Check Q1,SA1 and Q2 and D6~9.

■ AUTOMATIC TELEPHONE ANSWRING SYSTEM

1) NO FUNCTIONS OPERATE


Is the AC Adapter inserted into 120 V outlet?
Is Q15 emitter voltage 6 V?
NO
Check Q15 and D38.
YES
Is pin 21 of IC9 a low level after the AC adapter is plugged in?
NO
Check Q17 and D37.
YES
Does pin 24 of IC9 oscillate at 4.0 MHz?
NO
Check X1.
YES
Check IC9.

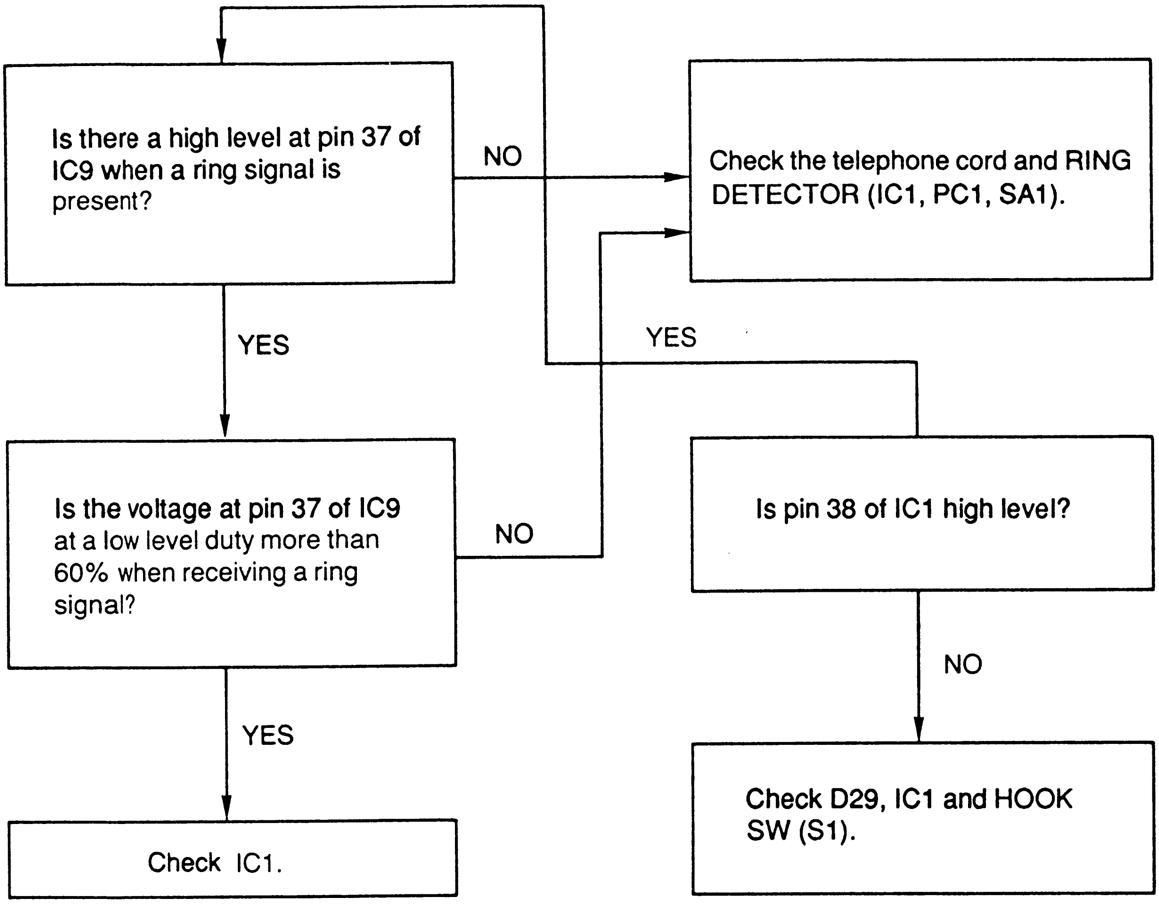
2) THE PULL OF PLUNGER IS POOR OR NOT AT ALL


Is there a high level as shown in the timing chart of "■ TAPE TRANSPORT CONTROL"? Check pin 1 and 44 of IC9.
OK
NG
Check IC9.
When pin 44 of IC9 is high level, collector of Q19 is low level?
NO
Check Q19.
YES
Is emitter of Q18 more than 12 V?
NO
Check AC Adaptor.
YES
When pin 1 of IC9 is high level, does emitter of Q18 output more than 10 V?
NO
Q18 and Q20.
YES
Check D40, D41 and D39.

3) OGM END MARK DETECTOR

Check D26, D27, IC4 and IC9.

4) DOES NOT ANSWER TELEPHONE CALL


Is there a high level at pin 37 of IC9 when a ring signal is present?
NO
Check the telephone cord and RING DETECTOR (IC1, PC1, SA1).
YES
YES
Is the voltage at pin 37 of IC9 at a low level duty more than 60% when receiving a ring signal?
NO
Is pin 38 of IC1 high level?
NO
YES
Check IC1.
Check D29, IC1 and HOOK SW (S1).

5) •ICM CONTINUES TO RECORD AFTER CALLER HANGS UP.

•END OF MESSAGE CLIPPED WHEN CALLER HANGS UP.

When caller hangs up, the KX-T2390 can detect the following 4 signal type.

A. CPC pulse.
B. Dial tone or other continuous tones.
C. Silence.
D. Cyclic signals.

A. Check CPC DETECTOR CIRCUIT (Q3, R12, R13, R14, R15, D35, R68).
B., C., D.
Check VOX DETECTOR CIRCUIT (R48, R49, R50, R51, R52, R53, C29, D26, D27, C74, C28, R46).
IC3).

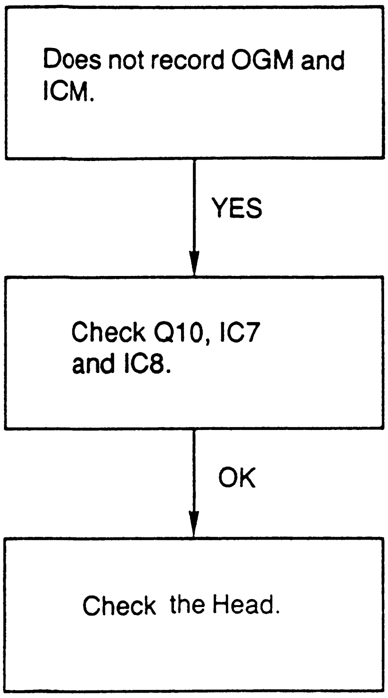
6) REMOTE CONTROLLER DOES NOT WORK/RESPONSE IS POOR.

The following are considered for the causes of no remote reception:

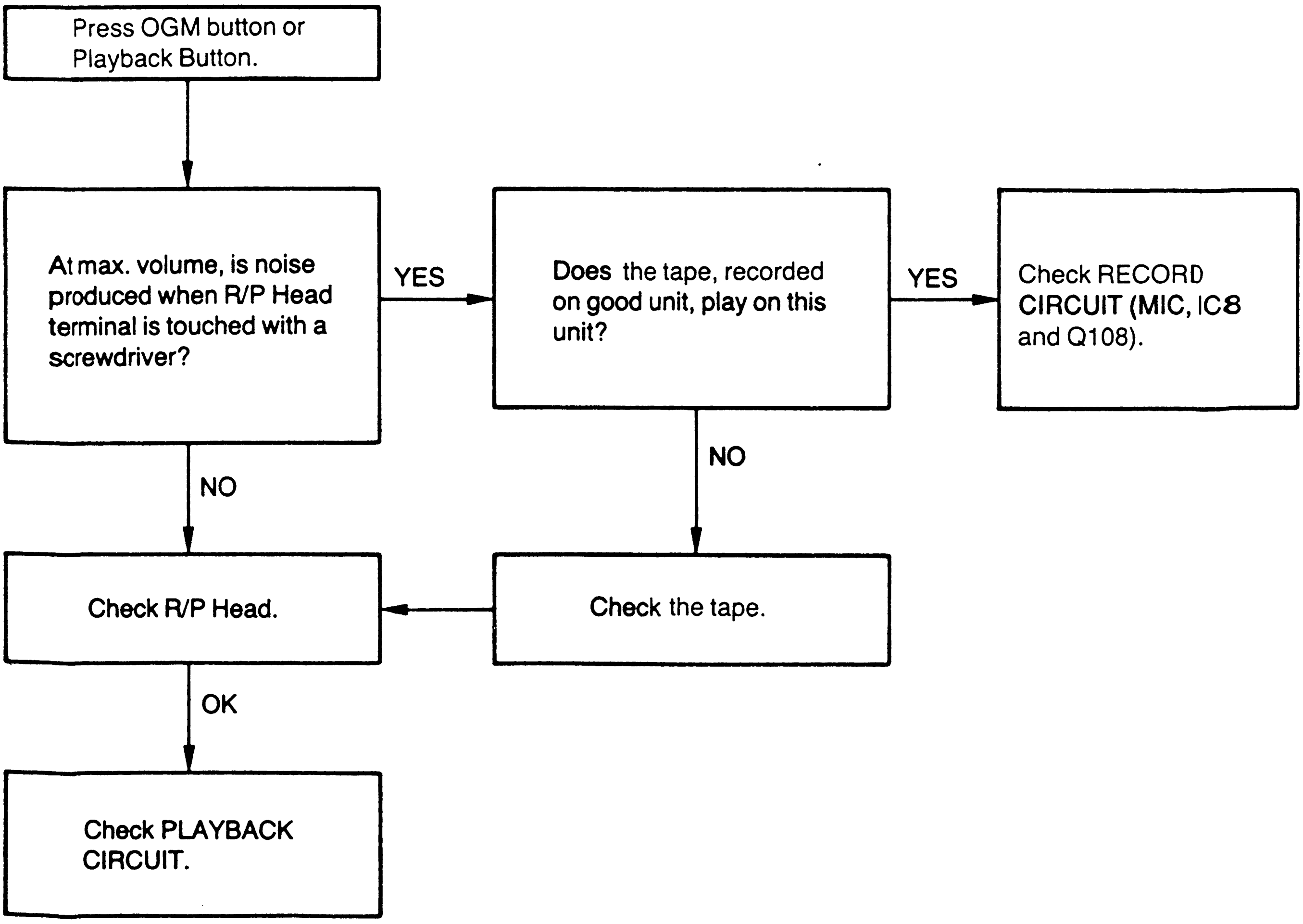
A. Does the security code of the unit fit in with the input code from the telephone line?
B. High distortion in LINE OUTPUT CIRCUIT causing interference between transmitting signal and remote signal.
C. Excessive loss in telephone line.
D. Remote Control Detective Circuit...defective frequency adjustment.

A. Check the security code of the unit.
B. Check LINE OUTPUT CIRCUIT (IC2).
C. Test on telephone line known to be working properly.
D. Adjust R57 and R59. (Refer to page 7.)

7) DOES NOT RECORD


Does not record OGM and ICM.
YES
Check Q10, IC7 and IC8.
OK
Check the Head.

8) NO OR LOW OGM PLAYBACK


Press OGM button or Playback Button.
At max. volume, is noise produced when R/P Head terminal is touched with a screwdriver?
YES
Does the tape, recorded on good unit, play on this unit?
YES
Check RECORD CIRCUIT (MIC, IC8 and Q108).
NO
NO
Check R/P Head.
Check the tape.
OK
Check PLAYBACK CIRCUIT.

CASSETTE DECK PARTS LOCATION

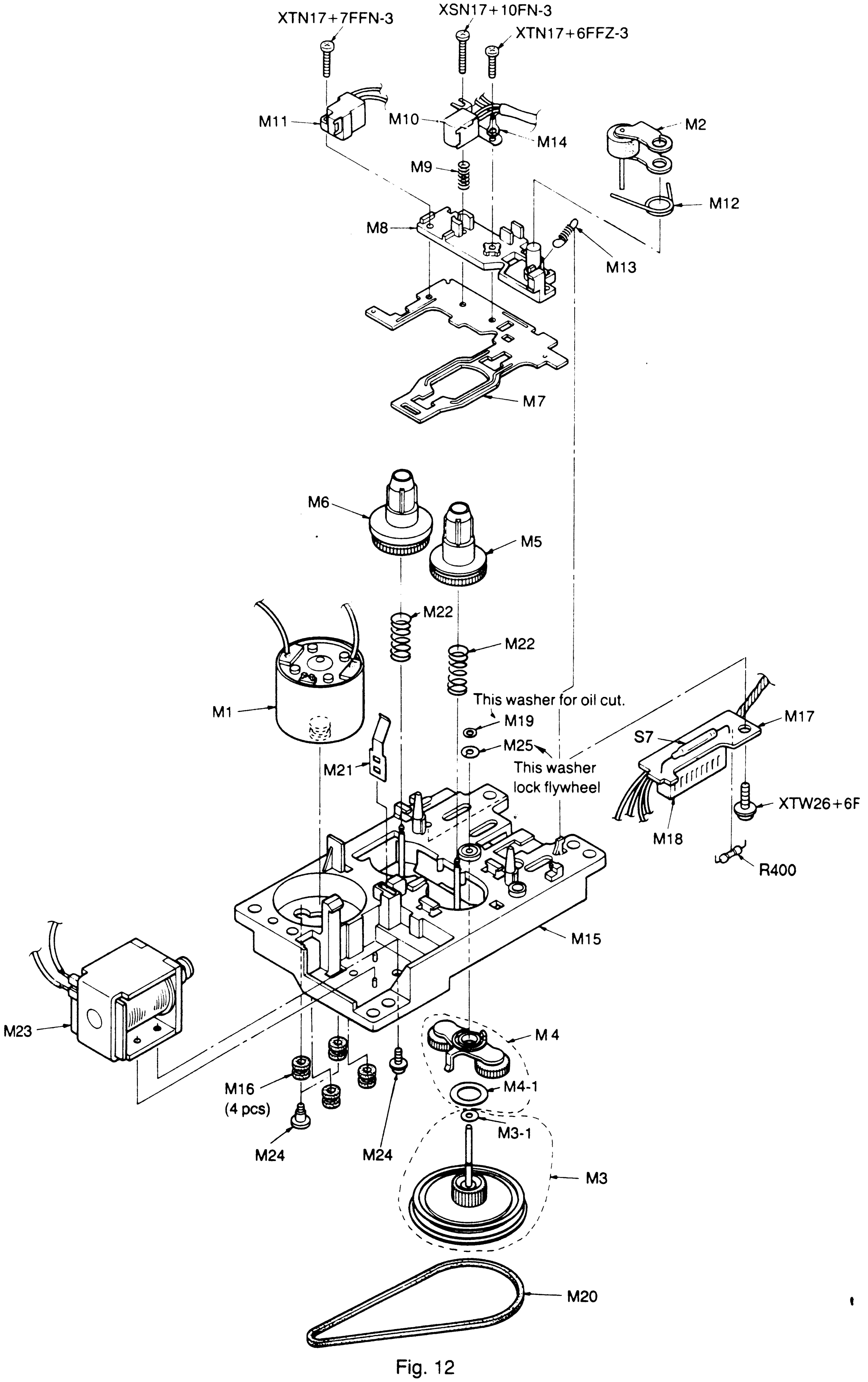

XTN17+7FFN-3
XSN17+10FN-3
XTN17+6FFZ-3
M11
M10
M14
M2
M9
M12
M8
M13
M7
M6
M5
M22
M22
M1
This washer for oil cut.
M19
M25
This washer lock flywheel
M21
M17
S7
XTW26+6F
M18
R400
M15
M23
M4
M4-1
M16 (4 pcs)
M3-1
M24
M24
M3
M20

Fig. 12

CABINET & ELECTRICAL PARTS LOCATION

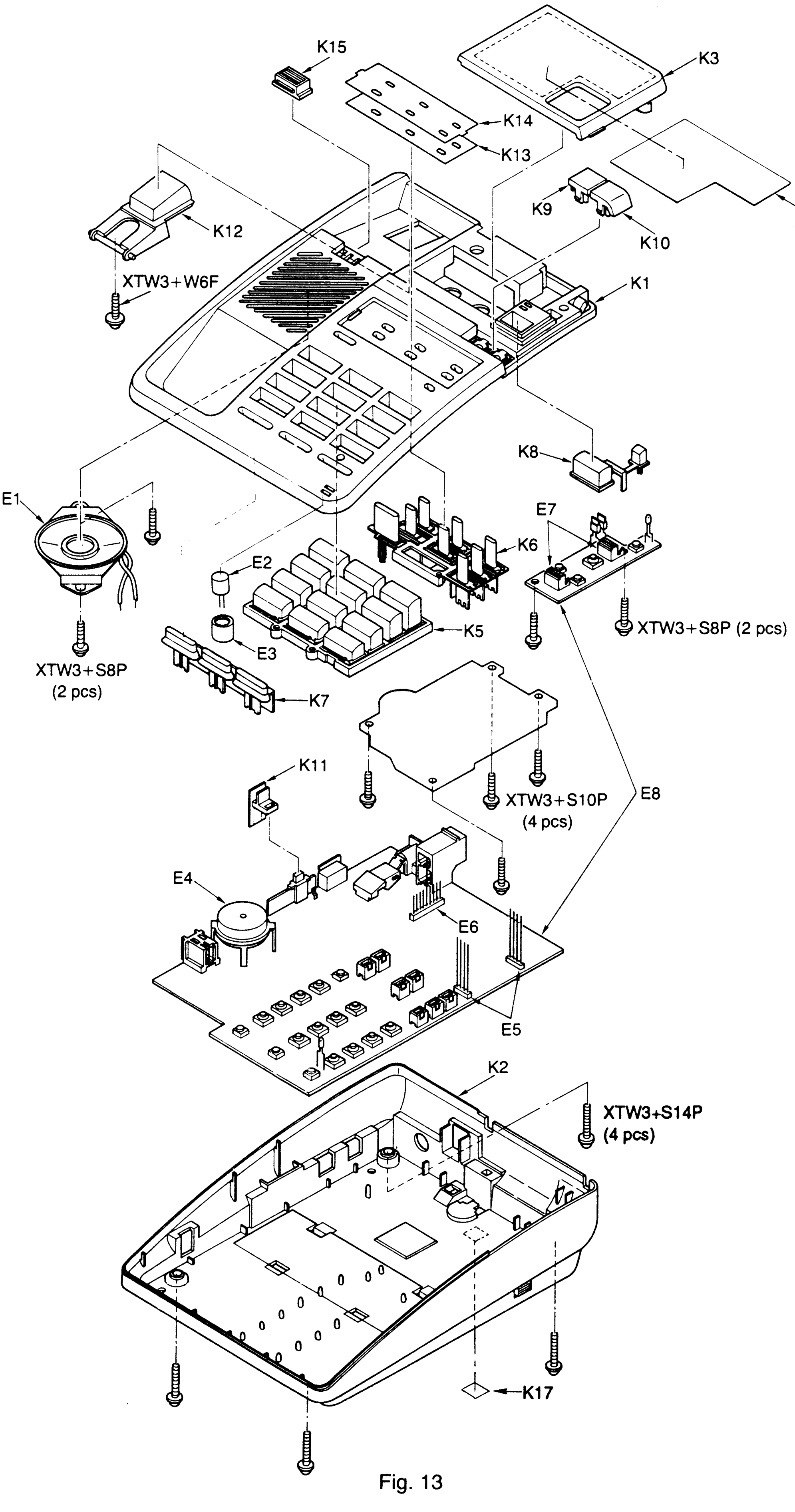

K15
K3
K14
K13
K9
K4
K12
K10
XTW3+W6F
K1
K8
E1
E7
K6
E2
K5
XTW3+S8P (2 pcs)
XTW3+S8P
(2 pcs)
E3
K7
K11
E8
XTW3+S10P
(4 pcs)
E4
E6
E5
K2
XTW3+S14P
(4 pcs)
K17

Fig. 13

HANDSET PARTS LOCATION

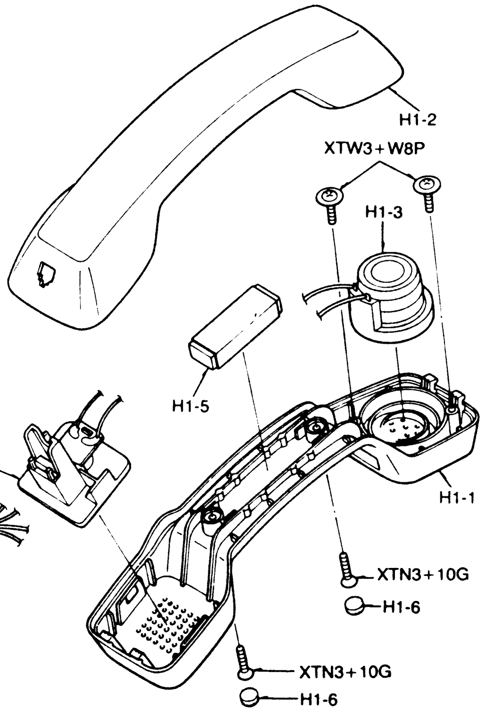

H1-2
XTW3+W8P
H1-3
H1-5
H1-4
H1-1
XTN3+10G
H1-6
XTN3+10G
H1-6

Fig. 14

ACCESSORIES & PACKING MATERIALS

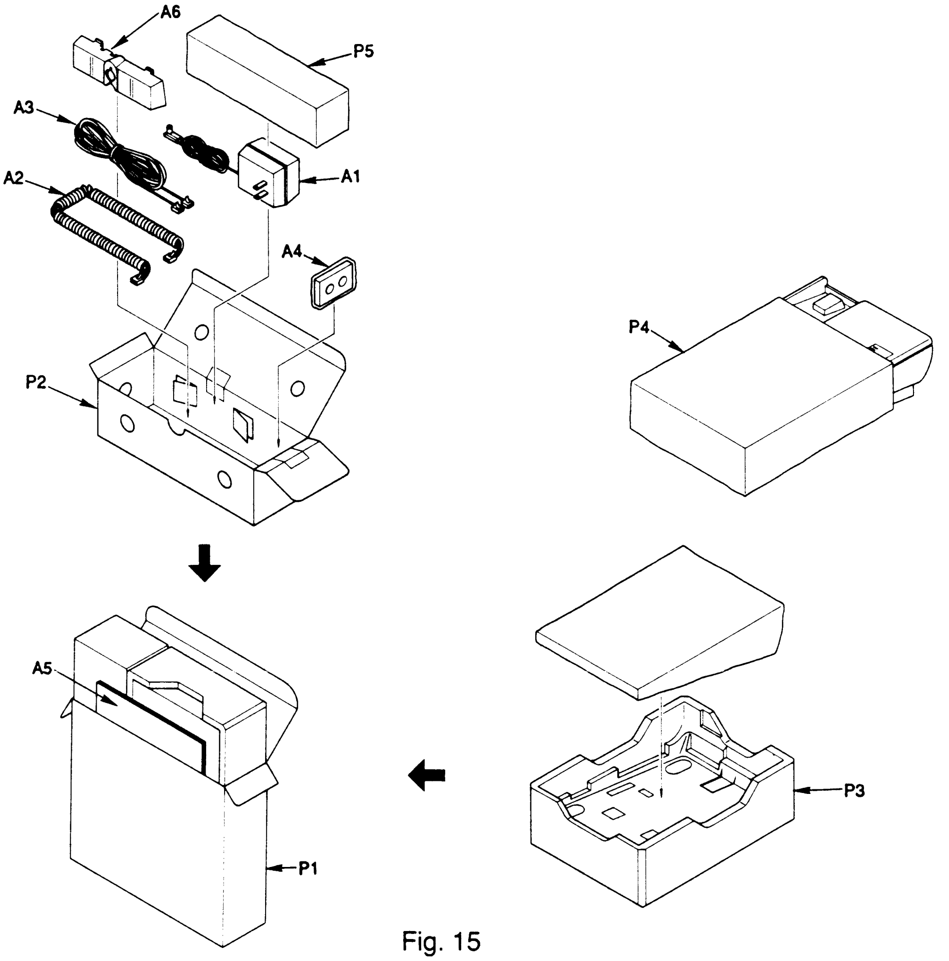

A6
P5
A3
A1
A2
A4
P2
P4
A5
P3
P1

Fig. 15

REPLACEMENT PARTS LIST

Model KX-T2390

Notes:

1. Printed circuit board assembly with mark (NLA) is no longer available after production discontinuation of the complete set.
2. Important safety notice.
   Components identified by the ⚠ mark special characteristics important for safety. when replacing any of these components, use only manufacture's specified parts.
3. The S mark indicates service standard parts and may differ from production parts.
4. RESISTORS & CAPACITORS
   Unless otherwise specified.
   All resistors are in ohms(Ω) k=l000Ω,M=l000kΩ
   All capacitors are in MICRO FARADS(μF) P=μμF

*Type &Wattage of Resistor

Type

ERC:Solid	ERX:Metal Film	PQ4R:Carbon
ERD:Carbon	ERG:Metal Oxide	ERS:Fusible Resistor
PQRD:Carbon	ER0:Metal Film	ERF:Cement Resistor

Wattage

10,16:1/8W	14,25:1/4W	12, 50, S1:1/2W	1:1W	2:2W	3:3W

*Type & Voltage of Capacitor

Type

ECFD:Semi-Conductor	ECCD,ECKD,ECBT,PQCBC : Ceramic
ECQS:Styrol	ECQE,ECQV,ECQG : Polyster
PQCUV:Chip	ECEA,ECSZ : Electrolytic
ECQMS:Mica	ECQP : Polyproplylene

Voltage

ECQ Type	ECQG ECQV Type	ECSZ Type	Others	
1H: 50V	05: 50V	0F:3.15V	0J :6.3V	1V :35V
2A:100V	1:100V	1A:10V	1A :10V	50,1H:50V
2E:250V	2:200V	1V:35V	1C :16V	1J :63V
2H:500V		0J:6.3V	1E,25:25V	2A :100V

CASSETTE DECK PARTS

M1	PQFM9913Z	Motor Ass'y (with Pulley)	1
M2	PQFD9913Z	Pinch Roller Ass'y	1
M3	PQFF9909Z	Flywheel Ass'y	1
M3-1	PQFN35Z	Washer	1
M4	PQFG9905Y	Gear Ass'y	1
M4-1	PQFN48Z	Washer	1
M5	PQFR9912Z	Takeup Reel Table Ass'y	1
M6	PQFR9914Z	Supply Reel Table Ass'y	1
M7	PQFD82Z	Head Base Plate	1
M8	PQFW42Z	Head Base	1
M9	PQFS73Z	Spring	1
M10	PQJH1M2Z	R/P Head	1
M11	PQJH6M2Z	Erase Head	1
M12	PQFS109Z	Spring	1
M13	PQFS110Z	Spring	1
M14	PQFJ2Z	Terminal	1
M15	PQFC9909X	Mechanism Chassis Ass'y	1
M16	PQFI14Z	Rubber Parts, Motor Spacer	2
M17	PQUP589Z	Reed Switch P.C.Board	1
M18	PQJS9B30Z	Connector, 9Pin	1
M19	PQFN33Z	Washer (for Oil cut)	2
M20	PQFB12Z	Belt	1
M21	PQFD64Z	Plate Spring	1
M22	PQFS82Z	Spring	2
M23	PQFP126Y	Plunger	1
M24	PQHD15Z	Screw	2
M25	PQFN49Z	Washer (for lock of flywheel)	1

INTEGRATED CIRCUITS, TRANSISTORS AND DIODES

Ref. No.	Part No.	Part Name & Description		Pcs
IC1	PQVIBA6565A	IC		1
IC2	PQVIBA8210N	IC		1
IC3	MN158413KPB	IC		1
IC4	PQVINJM4558D	IC		1
IC5, 6	PQVIIR3N05	IC	S	2
IC7	PQVITA7628P	IC		1
IC8	PQVITC4066BP	IC	S	1
IC9	PQVI4148HA41	IC		1
IC10	PQVIBA6220	IC		1
Q1	2SA1625	Transistor (Si)		1 ⚠
Q2	2SD662B	Transistor (Si)		1 ⚠
Q3	2SB1218A	Transistor (Si)	S	1
Q4~6, 8, 10~14, 17	2SD1819A	Transistor (Si)	S	10
Q7	UN5113	Transistor (Si)	S	1
Q9	UN5213	Transistor (Si)	S	1
Q15, 16	2SD1266	Transistor (Si)	S	2
Q18	2SB909M	Transistor (Si)		1
Q19, 20, 26	2SC3330	Transistor (Si)		3
Q21, 22, 24	2SA854	Transistor (Si)		3
Q23, 25	2SC1741S	Transistor (Si)		2
D1~4,12~17, 19, 22, 23, 25~33, 35, 36,40, 41, , 43, 44 57~59, 70	1SS131	Diode (Si)		32 ⚠
D5	MA4300	Diode (Si)	S	1 ⚠
D6~9	PQVD1A4	Diode (Si)		4 ⚠
D10	MA4051	Diode (Si)		1
D11	MA4150	Diode (Si)		1
D18	MA4062	Diode (Si)		1
D21	PQVDHZ2CLL02	Diode (Si)		1
D37	1S2076	Diode (Si)		1
D38, 42	PQVDMTZ6R8	Diode (Si)		2
D39	PQVDMTZ11B	Diode (Si)		1
D45, 47	LN28RPL	LED		2
D46	LN268RPXTAB2	LED		1
D48	LN368GP-JF3	LED		1

SWITCHES

S1	ESE14A211	Switch, Hook	1 ⚠
S3	PQSS3A17Y	Switch, Ringer	1
S4	EVQQEH06K	Switch, ON/FF	1
S11~23,	PQSH1A33Z	Switch, Dialing, Playback/Pause	13
S24~30	PQSH1A36Z	Switch, Direct Call, Lower	7
S31~34, 36~38	EVQ-QS205K	Switch, Program, Flash, Redial etc.	7
S100	PQSE91Z	Switch, Reed (for DECK)	1

CABINET PARTS

K1	PQYMT2390M	Upper Cabinet Assmebly	1
K2	PQYF1037Z8	Lower Cabinet Assembly	1
K3	PQKG8Z	Cassette Lid	1
K4	PQQT5080Z	Indication Plate Label	1
K5	PQBCX102Z1	Button, 12key	1
K6	PQBCX103Z	Button, Direct, Program, Lower	1
K7	PQBCX104Z	Button, Flash, Redial, Hold	1
K8	PQBCX105Z1	Button, Playback/Pause, OGM	1
K9	PQBC218Z	Button, REW	1
K10	PQBC220Z	Button, MEMO	1
K11	PQBD130Z	Knob, Volume	1
K12	PQBE25Z	Button, Hook	1
K13	PQHP5026Z	Telephone Card	1
K14	PQHR5188Z	Transparent Cover	1
K15	PQKE46Z	Hanger	1
K16	PQNW500T	Washer	1
K17	PQQT54Z	Label	1

ELECTRICAL PARTS

E1	PQAS5P05Z	Speaker	1
E2	PQJM120Z	Microphone	1
E3	PQHG536Z	Rubber, Microphone Cover	1
E4	PQWHT2390M	Buzzer Assembly	1
E5	PQJP4D77Z	Connector (CN2,CN3)	2
E6	PQJP9D8Z	Connector (CN1)	1
E7	PQJS4X41Y	Connector (CN2,CN3)	2
E8	PQWPT2390M	P.C.Board Assembly (NLA)	1

Ref. No.	Part No.	Part Name & Description	Pcs
		JACKS	
JJ1	PQJJ1TB18Z	Jack, Telephone	1 ⚠
JJ2	PQJJ2HA2Z	Jack, DC IN	1
		HANDSET PARTS	
H1	PQJX2PS403Y	Handset Assembly	1
H1-1	PQKM127L85	Lower Cabinet	1
H1-2	PQKF110Z85	Upper Cabbinet	1
H1-3	PQAX4P03Z	Speaker	1
H1-4	PQWMJX403Y	Microphone Assembly	1
H1-5	PQHM32Y	Weight	1
H1-6	PQHG695W	Rubber, Cap	2
		OTHERS	
SA1	PQVDSAE310F1	Varistor (Surge Absorber)	1 ⚠
X1	PQVBFC4004A3	Ceramic Filter S	1
X2	PQVBFC3584A1	Ceramic Filter	1
PC1	PQVIPC817K	Photo Electric Tranducer (Photo Coupler)	1
R57	PQNB3A00B53M	Semi-Fixed, Variable Resistor 5kΩ(B)	1
R59	EVN39C00YB53	Variable Resistor	1
R94	PQVAL204A14A	Variable Resistor, 10kΩ(B)	1
R126	PQNB3A00B52M	Semi-Fixed, Variable Resistor 500Ω(B) S	1
		ACCESSORIES	
A1	KX-A11-W	AC Adaptor	1
A2	PQJA30M	Handset Cord	1
A3	PQJA59Y	Telephone Cord S	1
A4	RT-N30-JT1P	Magnetic Recording Tape	1
A5	PQQX5810Z	Instruction Book	1
A6	PQKL28Z8	Stand	1
		PACKING MATERIALS	
P1	PQPK729Z	Gift Box	1
P2	PQPN970Z	Accessory Box	1
P3	PQPN971Z	Pad	1
P4	XZB26X40A01	Protection Cover (for SET)	1
P5	PQPH75Z	Protection Cover (for Handset)	1

Ref No.	Part No.	Value	Ref No.	Part No.	Value
		RESISTORS			
R1	ERDS1TJ622	6.2K ⚠	R25	PQ4R10XJ273	27K
R2	PQ4R10XJ123	12K	R26	ERD16TJ473	47K
R3	PQ4R10XJ334	330K	R27	PQ4R10XJ182	1.8K
R4	ERC14GK226	22M	R28	PQ4R10XJ471	470
R5	PQ4R10XJ124	120K	R29	PQ4R10XJ154	150K
R6	PQ4R10XJ223	22K	R30	PQ4R10XJ122	1.2K
R7	PQ4R10XJ392	3.9K	R31	PQ4R10XJ123	12K
R8	PQ4R10XJ683	68K ⚠	R32	PQ4R10XJ471	470
R9	PQ4R10XJ104	100K ⚠	R33	Not Used	
R10	PQ4R10XJ472	4.7K ⚠	R34	PQ4R10XJ103	10K
R11	PQ4R10XJ102	1K	R35	PQ4R10XJ103	10K
R12	ERDS1TJ680	68	R36	PQ4R10XJ472	4.7K
R13	PQ4R10XJ102	1K	R37	ERD16TJ473	47K
R14	PQ4R10XJ473	47K	R38	PQ4R10XJ223	22K
R15	PQ4R10XJ563	56K	R39	ERD16TJ104	100K
R16	PQ4R18XJ473	47K	R40	PQ4R10XJ104	100K
R17	PQ4R10XJ682	6.8K	R41	PQ4R18XJ104	100K
R18	PQ4R10XJ103	10K	R42	Not Used	
R19	PQ4R10XJ473	47K	R43	PQ4R10XJ335	3.3M
R20	PQ4R10XJ104	100K	R44	ERD16TJ474	470K
R21	PQ4R10XJ473	47K	R45	PQ4R10XJ472	4.7K
R22	PQ4R10XJ473	47K	R46	PQ4R10XJ563	56K
R23	Not Used		R47	PQ4R10XJ824	820K
R24	PQ4R10XJ392	3.9K	R48	PQ4R10XJ184	180K

Ref. No.	Part No.	Value	Ref. No.	Part No.	Value
R49	PQ4R10XJ563	56K	R97	ERD16TJ224	220K
R50	PQ4R10XJ104	100K	R98	PQ4R10XJ562	5.6K
R51	PQ4R10XJ472	4.7K	R99	PQ4R10XJ104	100K
R52	PQ4R10XJ182	1.8K	R100	PQ4R10XJ273	27K
R53	PQ4R10XJ472	4.7K	R101	PQ4R10XJ273	27K
R54	ERD16TJ103	10K	R102	PQ4R10XJ104	100K
R55	PQ4R10XJ223	22K	R103	PQ4R10XJ473	47K
R56	PQ4R10XJ113	11K	R104	PQ4R10XJ104	100K
R58	PQ4R10XJ102	1K	R105	PQ4R10XJ183	18K
R60	PQ4R10XJ912	9.1K	R106	PQRD12VJ391	390
R61	PQ4R10XJ682	6.8K	R107	PQRQ2VJ100	10
R62	PQ4R10XJ155	1.5M	R108	PQRD12VJ221	220
R63	PQ4R10XJ104	100K	R109	ERD16TJ473	47K
R64	PQ4R10XJ104	100K	R110	ERD16TJ102	1K
R65	PQ4R10XJ104	100K	R111	ERD16TJ103	10K
R66	PQ4R10XJ104	100K	R112	ERD25TJ120	12
R67	PQ4R10XJ104	100K	R113	ERD16TJ681	680
R68	PQ4R10XJ684	680K	R114	PQ4R10XJ473	47K
R69	PQ4R10XJ224	220K	R115	PQ4R10XJ471	470
R70	PQ4R10XJ683	68K	R116	PQ4R10XJ473	47K
R71	PQ4R10XJ223	22K	R117	PQ4R10XJ471	470
R72	PQ4R10XJ105	1M	R118	PQ4R10XJ681	680
R73	PQ4R10XJ102	1K	R119	PQ4R10XJ473	47K
R74	PQ4R10X334	330K	R120	PQ4R10XJ681	680
R75	PQ4R10XJ681	680	R121	ERD16TJ103	10K
R76	PQ4R10XJ681	680	R122	PQ4R10XJ473	47K
R77	PQ4R10XJ103	10K	R123	PQ4R10XJ221	220
R78	PQ4R10XJ473	47K	R124	PQ4R10XJ221	220
R79	PQ4R10XJ272	2.7K	R125	PQ4R10XJ151	150
R80	PQ4R10XJ182	1.8K	R127	PQ4R18XJ681	680
R81	PQ4R10XJ682	6.8K	R128	PQ4R18XJ332	3.3K
R82	PQ4R10XJ333	33K	R129	PQ4R18XJ271	270
R83	PQ4R10XJ183	18K	R130	ERD16TJ152	1.5K
R84	PQ4R10XJ334	330K	R131	PQ4R10XJ470	47
R85	PQ4R10XJ225	2.2M	R132	PQ4R10XJ335	3.3M
R86	PQ4R10XJ103	10K	R133	PQ4R10XJ273	27K
R87	PQ4R10XJ223	22K	R134	Not Used	
R88	PQ4R10XJ271	270	R135	PQ4R10XJ103	10K
R89	PQ4R10XJ334	330K	R136	PQ4R10XJ330	33
R90	ERD25TJ100	10			
R91	PQ4R10XJ222	2.2K	R140	PQ4R10XJ183	18K
R92	PQ4R10XJ470	47			
R93	PQ4R10XJ103	10K	R400	PQRDS2TJ563 (for DECK)	56K
R94	Not Used				
R95	PQ4R10XJ104	100K			
R96	PQ4R10XJ103	10K			

Ref. No.	Part No.	Value	Ref. No.	Part No.	Value
CAPACITORS					
C1	ECQE2105KF	1 ⚠ S	C40	ECEA1HKS010	1
C2	ECEA1HU100	10	C41	ECEA1AKS330	33 S
C3	ECEA1HUR22	0.22	C42	PQCUV1H681JC	680P
C4	ECQG1H822JZ	0.0082	C43	ECEA1HKS100	10
C5	PQCUV1H223KB	0.022 S	C44	PQCUV1H103KB	0.01 S
C6	ECEA1HU100	10	C45	PQCUV1H821JC	820P
C7	ECEA1CU221	220	C46	ECEA1AU221	220
C8	ECEA1HKS010	1	C47	ECEA1HKS010	1
C9	PQCUV1H103KB	0.01 S	C48	PQCUV1H102J	0.01 S
C10	ECEA1HK4R7	4.7	C49	ECEA1EK470	47 S
C11	PQCUV1H822MD	0.0082	C50	ECEA1HUR47	0.47
C12	PQCUV1H562MD	0.0056 S	C51	ECEA1HKS010	1
C13	PQCUV1H332KB	0.0033 S	C52	PQCUV1H103KB	0.01 S
C14	PQCUV1C334ZF	0.33	C53	ECEA1HKS3R3	3.3
C15	ECEA1HU220	22 S	C54	PQCUV1H472KB	0.0047 S
C16	ECFD1E103KD	0.01	C55	ECEA1HUR33	0.33
C17	PQCUV1H472KB	0.0047 S	C56	PQCUV1H103KB	0.01 S
C18	ECFD1E103KD	0.01 S	C57	PQCUV1H681JC	680P
C19	PQCUV1H103KB	0.01 S	C58	ECEA0JKS101	100 S
C20	ECEA1HKS100	10	C59	PQCUV1H103KB	0.01 S
C21	ECEA1AU221	220	C60	ECEA1HU220	22 S
C22	ECFD1C104KD	0.1 S	C61	Not Used	
C23	PQCUV1E473MD	0.047	C62	ECEA1AU221	220
4	Not Used		C63	ECEA1EK470	47 S
25	ECEA1AU471	470	C64	ECEA1HKS0R1	0.1 S
C26	PQCUV1H102J	0.001 S	C65	ECFD1C104KD	0.1 S
C27	ECFD1C104KD	0.1 S	C66	PQCUV1H103KB	0.01 S
C28	ECEA1HKS0R1	0.1 S	C67	PQCUV1H103KB	0.01 S
C29	ECEA1AU101	100	C68	ECEA1HKS3R3	3.3
C30	ECEA1HU100	10 S	C69	ECEA0JU332	3300
C31	ECEA1HKS3R3	3.3 S	C70	Not Used	
C32	PQCUV1H223KB	0.022 S	C71	PQCUV1H223KB	0.022 S
C33	ECEA1HU100	10 S	C72	ECKD2H681KB	680P ⚠
C34	ECEA1EU4R7	4.7	C73	ECKD2H681KB	680P ⚠
C35	PQCUV1H103KB	0.01 S	C74	ECUV1H103KB	0.01 S
C36	ECQV1H104JZ	0.1	C75	PQCUV1H103KB	0.01 S
C37	ECQV1H683JZ	0.068	C76	PQCUV1H472KB	0.0047 S
C38	PQCUV1H103KB	0.01 S	C77	PQCUV1H472KB	0.0047 S
C39	PQCUV1H103KB	0.01 S	C78	PQCUV1H102J	0.001 S
			C83	PQCUV1C683MD	0.068

OPERATIONS

PROGRAMMING THE DIALING MODE

Dialing mode is usually set to "TONE". If dialing cannot be done, set the mode to "PULSE".

1. Push **PROGRAM** until the MEMORY indicator lights.
2. Push **REDIAL**, then push **"0"** for dialing mode setting.
3. Push **"7"** or **"8"**.
   - Push "7" for "PULSE" mode.
   - Push "8" for "TONE" mode.
4. Push **HOLD**.
5. Push **PROGRAM**.

MANUAL DIALING AND RECEIVING

Dialing

1. Lift the handset.
2. Dial the phone number.
   - When the line is busy, push **REDIAL**.
3. Hang up the handset when finished conversaion.

Receiving

1. Lift the handset and start speaking.

AUTOMATIC DIALING

There are 6 DIRECT CALL buttons (12 memory stations):
These direct call button consists of two functions (upper and lower), and each location is capable of storing 16 digits each.

Programming

Be sure that the handset is on the cradle and the AC adaptor is connected.

1. Push **PROGRAM** until the MEMORY indicator lights.
2. Push DIRECT CALL button.
   - Push **LOWER** button first for storing in the lower memory section.
3. Push **HOLD**.
4. Push **PROGRAM**.

Dialing

1. Lift the handset.
2. Push **DIRECT CALL** button of the phone number that you want to call.
   - Push **LOWER** first for dialing the number stored in the lower memory station.
3. Hang up the handset when finished conversation.

OGM RECORDING

1. Push **OGM**. until a long beep is heard.
2. Speak clearly and loudly into the **MIC**.
   - Recording time is up to 30 seconds.
3. When finished, push **OGM** again.
4. Push **OGM** quickly to confirm your OGM.
   - If you hold the button too long, the unit will go into the recording mode.

■ The unit automatically change to the Answer mode, 10 seconds after completing the OGM recording. At this time, the ANSWER/CALL indicator will light.

LISTENING TO THE MESSAGES

When the telephone rings, the unit will play back the OGM, then it will record the caller's message on the tape.

1 Push **PLAYBACK/PAUSE**.

■ **Auto-Logic (One Touch Operation)**

One touch on the PLAYBACK/PAUSE button allows the unit to play back the messages and sound 3 beeps after the last message.

Then 10 seconds later, the unit will rewind the tape and be ready to record new messages from the beginning of the ICM part of the tape.

RECORDING A PERSONAL MESSAGE (MESSAGE MEMO)

You may record a message any time at home on the ICM part of the tape. It will be heard by any one using the remote code operation or manual playing back messages.

1 Push **MEMO/2 WAY** until a beep sounds.

2 Speak into the MIC.
Recording time is 30 seconds.

3 Push **MEMO/2 WAY** when finished conversation.

MONITORING THE INCOMING MESSAGE

While an Incoming Message is being record, you can hear it.

1 Adjust the VOLUME CONTROL.

You want to talk to the caller during recording of the ICM, lift the handset and talk.

LISTENING TO THE MESSAGES FROM A REMOTE PHONE

You can listen to the recorded messages by simply pushing the code number.

1 Call your unit and push the Code No. for 1~2 seconds during OGM or ICM recording mode.
- The unit will rewind the tape, and you will hear all the messages on the tape.
- 3 beeps will be heard after the last message.

2 Hang up.
- Future Incoming Messages will be recorded after the last message.

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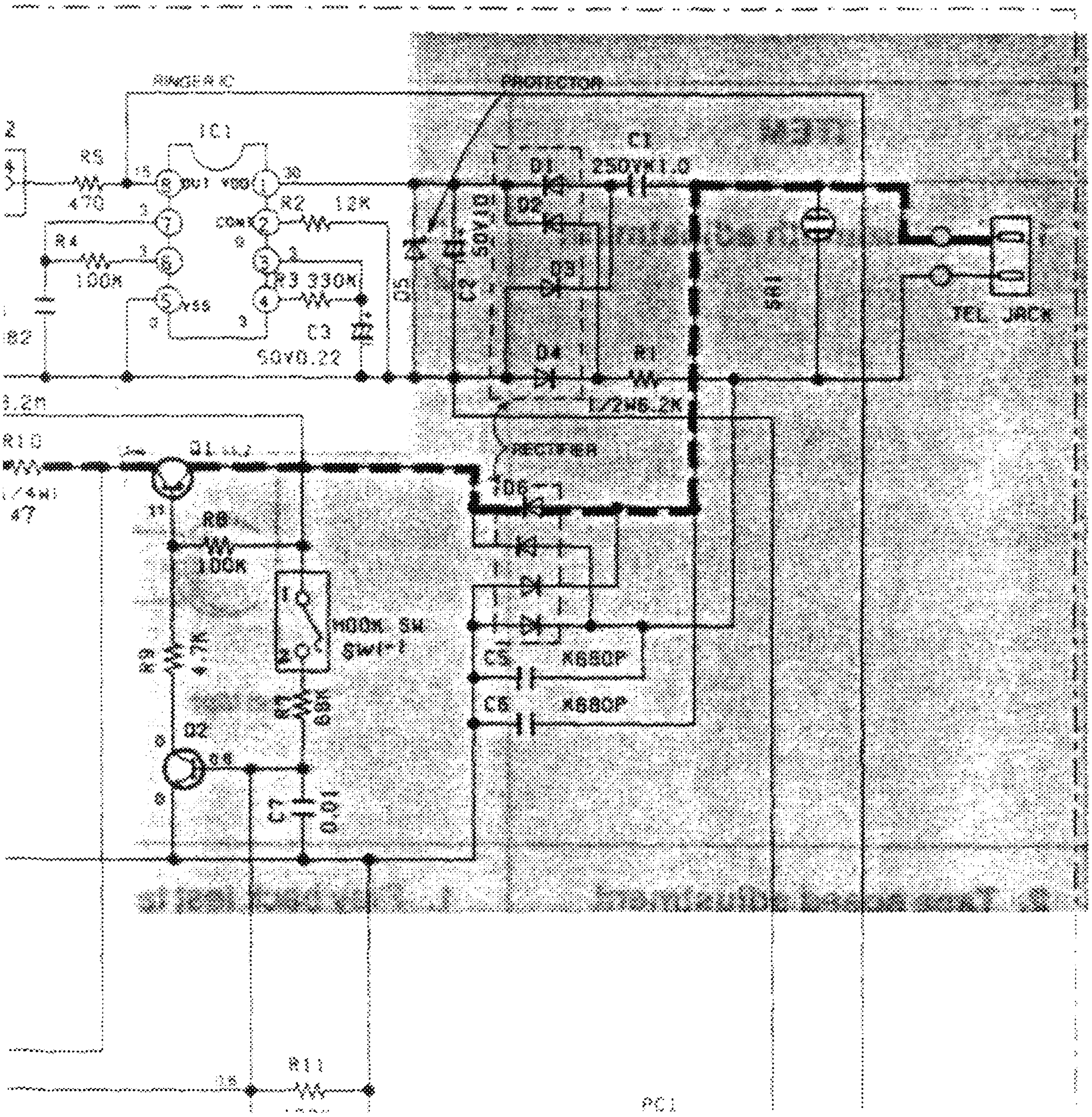
RINGER IC
PROTECTOR
IC1
R5
470
R4
100K
R2 12K
R3 330K
C3
50V0.22
C2
50V10
C1
250VK1.0
D1
D2
D3
D4
R1
1/2W6.2K
SA1
TEL JACK
RECTIFIER
D6
R10
Q1
R8
100K
HOOK SW
SW1-1
R9
4.7K
R7
68K
Q2
C7
0.01
C5
K680P
C6
K680P
R11
PC1